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THE DEATH OF SOUTH DAKOTA'S GOVERNOR: TRAGIC ACCIDENT OR FAA BUNGLE?

4. G 74/7: D 34/2

e Death of South Dakota's Governo...

HEARING

BEFORE THE

EMPLOYMENT, HOUSING, AND AVIATION SUBCOMMITTEE

OF THE

COMMITTEE ON GOVERNMENT OPERATIONS HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRD CONGRESS

FIRST SESSION

MAY 19, 1993

Printed for the use of the Committee on Government Operations

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DEATH OF SOUTH DAKOTA'S GOVERNOR: TRAGIC ACCIDENT OR FAA BUNGLE?

WEDNESDAY, MAY 19, 1993

House of Representatives,
Employment, Housing, and Aviation Subcommittee
of the Committee on Government Operations,
Washington, DC.

The subcommittee met, pursuant to notice, at 11 a.m., in room 2247, Rayburn House Office Building, Hon. Collin C. Peterson (chairman of the subcommittee) presiding.

Present: Representatives Collin C. Peterson, Floyd H. Flake, and Karen L. Thurman.

Also present: Representative Tim Johnson.

Staff present: Edith A. Holleman, staff director; Lisa Phillips, professional staff member; Andrea Nelson, counsel; June Saxton, clerk; and Michael D. Nannini, minority professional staff, Committee on Government Operations.

OPENING STATEMENT OF CHAIRMAN PETERSON

Mr. Peterson. The subcommittee will be in order. Again, we apologize. We got fouled up because the President was supposed to be in at 8:15, and as is his style he was tied up a little bit later. So, anyway, we need two members of the subcommittee before we can proceed.

Before I make my opening statement, I'd first like to welcome to this subcommittee hearing Representative Tim Johnson, South Dakota's only Member of the House of Representatives. George Mickelson, South Dakota's Governor, his two pilots, and several aides and advisers died in a recent plane crash in Iowa which was very similar to the incident in Utica, NY, that we are focusing on today, and I am pleased to have my subcommittee chairman of the Agriculture General Commodities Subcommittee, Representative Tim Johnson, be with me today and participate.

We appreciate your help and your staff's cooperation in the work that we have been doing.

I also would like to say that any members that have opening statements, they will be made part of the record. I understand that Mr. Clinger has a statement and some questions that he would like submitted. We will do that on his behalf. When Mr. Machtley gets here, he can present his statements. Otherwise, we will just make them a part of the record.

One month ago today, on April 19, a small plane carrying the Governor of South Dakota, two pilots, several aides and South Dakota businessmen lost a propeller blade, crashed into a silo in

Iowa, and burned. All eight of those occupants were killed instantly.

Preliminary evidence indicates that the blade flew off because of a fatigue crack in the propeller hub. This was not the first time such a failure had occurred. In September 1991, a similar, but nonfatal, incident involving the same type of four-blade propeller and Mitsubishi aircraft almost brought a plane down in Utica, NY.

In that incident, the NTSB concluded that the cause of the fatigue crack was most likely manufacturing scratches on the hubs.

Based on that investigation, the National Transportation Safety Board had been attempting without success since August 1992 to get the Federal Aviation Administration to issue an airworthiness directive requiring an inspection of this type of propeller hub. The Safety Board had warned the FAA twice, most recently in March of this year, that a catastrophic accident might occur if these inspections did not take place.

I can only describe the FAA's response as superficial and negligent. The FAA told the NTSB that inspection was not necessary—first, because the FAA and the manufacturer did not accept the Board's conclusion that manufacturing scratches probably initiated the fatigue cracks, and, second, because magnetic particle inspections of the hubs during the mandatory propeller overhauls at 3,000 hours had not revealed any fatigue cracks.

An important, unstated reason, however, was that the manufacturer's protest that the inspection of thousands of propellers was too expensive when only one propeller hub had failed. The FAA also inexplicably ignored the manufacturer's suggestion that only the propeller hubs on the Mitsubishi MU–2B–60's, the aircraft involved in both of these accidents, be inspected. This approach would have required less than 120 inspections and may well have avoided the Iowa tragedy.

In its prepared testimony, the FAA claims that it was working with the manufacturer to "implement the intent of the NTSB recommendations" to develop a nondestructive technique to inspect the hubs without taking off the propellers. In the papers that we have reviewed, there is no indication of any kind of effort by the FAA to implement this or any other aspect of NTSB's recommendations prior to April 12, 1993.

The NTSB witness, who has spoken with the manufacturer, will testify that the FAA never even asked the manufacturer to develop such a technique. The FAA also failed to review the design and fabrication of similar three- and five-blade propeller hubs to see if they should also be inspected as recommended by the NTSB.

And, as I have already stated, it failed to make any alternative proposals to the Board for more limited, less expensive inspections. Instead, the FAA and the manufacturer concentrated on attempts to find other causes for the Utica accident than those stated in the NTSB's report. To date, they have not found any.

Twice, the FAA was told by the Safety Board that its refusal to require nps was an unacceptable response to correct a condition that could result in significant loss of life and property. The NTSB also informed the FAA that a routine, 3,000-hour inspection of the propeller hubs using magnetic particle inspections was useless. It could not reveal any scratches or fatigue cracks because it did not allow the inspectors to check the area where those cracks would be emanating.

The Safety Board does not have the power to require enforcement of its recommendations to the FAA. It can only persuade the FAA by the quality of its research and firmness of its recommendations. The FAA alone is responsible for ordering aircraft manufacturers and pilots to comply with safety procedures and inspections.

In its prepared testimony, the FAA makes a particular point of noting that it met all of the statutory time limits for responding to NTSB, and that is true. Every 90 days there was a letter from the FAA stating that it didn't think an inspection was necessary. But the keeping of regulatory schedules by bureaucrats does not and cannot, in and of itself, protect human life.

The lackadaisical manner with which the FAA chose to respond to the NTSB continued until eight individuals lost their lives. And even now the FAA has only ordered the partial compliance with the NTSB's recommendations that the manufacturer had suggested several months ago: The inspection of the propellers on Mitsubishi MU–2B–60 aircraft. The NTSB continues to advocate for a broader inspection.

The flying public cannot afford this lack of attention to their safety and to their very lives. We must demand that the FAA be more responsive to the solid research and recommendations of the NTSB and less responsive to the protests of manufacturers. In this case, eight lives depended on it. In the future, your life and my life could depend on it.

We will now recognize other subcommittee members for opening statements. Mrs. Thurman, do you have an opening statement? We appreciate you being with us.

I will now recognize my friend from South Dakota for any statement that he may wish to give at this time.

STATEMENT OF HON. TIM JOHNSON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF SOUTH DAKOTA

Mr. JOHNSON. Well, Thank you, Mr. Chairman. I appreciate this opportunity to be here with you today and with the subcommittee today to address the critically important issue of safety in the aviation industry. I want to thank you for asking me to participate, and I commend you for your impressive and expeditious reaction to the plane crash that claimed the lives of the South Dakota Governor, George Mickelson, and seven others 1 month ago today. It is impossible to adequately convey the profound and abiding sense of personal loss that has been experienced by the friends and families of these men, and by the entire State which I represent.

I am confident that today's hearing will allow a thorough examination of not only the effectiveness of the overall working relationship between the FAA and NTSB, but also the decisionmaking process surrounding the rejection of the National Transportation Safety Board's recommendations to the FAA relative to the possibility of a manufacturing error on Hartzell propeller hubs. Cracks found on a Hartzell propeller hub were responsible for an incident in Utica, NY in 1991, and although the investigation is still underway, the plane that crashed which carried the eight South Dakotans last month also had a Hartzell propeller hub and a cracked hub is thought to be the cause of that fatal accident.

Following the first incident involving the propeller hubs the NTSB made three recommendations to the FAA which it felt would ensure that similar incidents would not occur again. The FAA chose not to adopt the NTSB recommendations, and I appreciate this opportunity to look into the reasoning behind that decision.

The loss of life always raises serious questions, and I think this is especially true when lives are taken in such a tragic way. My hope is that this hearing will not only answer some of those questions that have been raised all over South Dakota in the aftermath of this crash, but also, and as importantly, ensure that similar tragedies are avoided everywhere throughout this Nation in the future.

I'm pleased that along with my work in pursuing answers to the problem of relationship between the NTSB and the FAA, our two Senators from South Dakota have also played a very active and very leading role. Senator Tom Daschle has played a very constructive role in meeting with both the NTSB and FAA and to raising the visibility of these concerns. And Senator Larry Pressler as well has worked very hard on this issue in helping to raise the visibility and to probe the great concerns that we have. I want to acknowledge Senator Pressler's presence here at this hearing today, and I'm very pleased to have his constructive contributions to this analysis that goes on through the hearing process.

[The prepared statement of Mr. Johnson follows:]

REMARKS BY CONGRESSMAN TIM JOHNSON

BEFORE THE HOUSE GOVERNMENT OPERATIONS SUBCOMMITTEE ON HOUSING, EMPLOYMENT, AND AVIATION

THE HONORABLE COLLIN PETERSON

MAY 19, 1993

Mr. Chairman, I appreciate the opportunity to be here with you and this subcommittee today to address the important issue of safety in the aviation industry. I thank you for asking me to participate, and commend you for your impressive and expeditious reaction to the plane crash that claimed the lives of the South Dakota Governor George Mickelson and seven others a month ago today. It is impossible to adequately convey the profound and abiding sense of personal loss that has been experienced by the friends and families of the men, and by the entire state which I represent.

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The loss of life always raises questions, and I think that this is especially true when lives are taken in such a tragic way. My hope is that this hearing will not only answer some of these questions that have been raised all over South Dakota in the aftermath of the crash, but also, and almost more importantly, ensure that similar tragedies are avoided in the future.

Mr. PETERSON. Thank you very much, Mr. Johnson. We appreciate, as I say, your work and the work of your staff, and your interest.

Representative Flake, we welcome you. Do you have a statement?

Mr. FLAKE. Thank you, Mr. Chairman. I ask unanimous consent to have a statement placed in the record. I do not have a written statement at this time.

Mr. PETERSON. Very good.

[The prepared statement of Mr. Flake follows:]

STATEMENT FOR
CONGRESSMAN FLOYD H. FLAKE
BEFORE THE
SUBCOMMITTEE ON EMPLOYMENT, HOUSING AND AVIATION
MAY 19, 1993

GOOD MORNING MR. CHAIRMAN AND MEMBERS OF THE EMPLOYMENT, HOUSING AND AVIATION SUBCOMMITTEE. I WOULD LIKE TO THANK THE CHAIRMAN FOR HOLDING THIS HEARING TO EXAMINE THE RESPONSIVENESS OF THE FEDERAL AVIATION ADMINISTRATION (FAA) TO THE SAFETY RECOMMENDATIONS PROPOSED BY THE NATIONAL TRANSPORTATION SAFETY BOARD (NTSB). I WOULD ALSO LIKE TO WELCOME OUR WITNESSES AND THANK THEM FOR THE INSIGHT THAT THEY WILL PROVIDE.

IN PARTICULAR, I WOULD LIKE TO EXAMINE THE CIRCUMSTANCES SURROUNDING THE APPARENT PROPELLER FAILURE OF A SMALL CARGO PLANE IN 1991 AND THE RECENT PROPELLER FAILURE ON A SIMILAR AIRCRAFT THAT RESULTED IN THE DEATHS OF THE GOVERNOR OF SOUTH DAKOTA AND SEVEN ADDITIONAL PASSENGERS. I WOULD LIKE TO REACH AN UNDERSTANDING OF THE ROLE OF THE NTSB AND THE FAA IN EACH OF THESE TRAGEDIES. HOPEFULLY, WE CAN DETERMINE WHERE THE BREAKDOWN IN COMMUNICATION OCCURRED BETWEEN THESE TWO AGENCIES AND ASCERTAIN A WAY TO MAKE THE FAA MORE RESPONSIVE TO THE SUGGESTIONS OF THE NTSB. OUR ULTIMATE GOAL IN THIS PROCESS IS TO PROTECT THE UNNECESSARY LOSS OF LIFE.

AGAIN, I WOULD LIKE TO WELCOME OUR WITNESSES AND THANK THEM FOR THE TESTIMONY THAT THEY WILL PROVIDE.

Mr. FLAKE. Look forward to hearing our witnesses this morning. Thank you.

Mr. PETERSON. Thank you.

Senator Pressler has a brief statement, and we would welcome him to present that at this time. We appreciate your interest and your being with us this morning, Senator.

STATEMENT OF HON. LARRY PRESSLER, A SENATOR IN CONGRESS FROM THE STATE OF SOUTH DAKOTA

Mr. PRESSLER. Thank you very much, Mr. Chairman. I shall summarize my statement and place the full text of my remarks in the record, because I know the time is short, and I am also eager to hear the witnesses who are here.

I am appalled by what appears to be the sloppy, lazy, bureaucratic work by the FAA on this matter. I also wish to submit to the committee several letters I received spontaneously from different people from as far away as Hawaii to different lawyers who have worked on similar matters with the FAA. I placed some of these in the Congressional Record yesterday. I will submit portions of them for your perusal today.

The situation that has occurred unquestionably must be demoralizing to the many loyal and dedicated employees of the FAA and the aviation industry. I am speaking of those who are genuinely planning and striving to make aviation as safe as it should be. Nevertheless, my fellow South Dakotans and I are very disturbed about the tragedy that occurred. We do not wish to point a finger of blame without a chance for rebuttal. I know that the purpose of this hearing is not to vent our anger, but it is to try to dig out the facts.

As public officials we have a duty to all citizens in this country who are reliant on our air transportation system and believe that the Federal Government, in this case the FAA, is performing its duties.

The bottom line is clear. We have two agencies charged with the safety of small aircraft and its passengers. When these two agencies disagree over a safety issue, a dangerous form of gridlock occurs. While this disagreement languishes unresolved, those potentially affected are still flying potentially dangerous aircraft. This gridlock may have claimed the lives of eight South Dakotans.

Before additional fatalities occur, let's look at the process between these two agencies. I commend this committee. I wish to submit my entire statement for the record, and the additional materials that have come to me in the mail. I look forward to hearing the witnesses and I thank the committee very much for hearing me.

Mr. PETERSON. Thank you very much, Senator Pressler. Your statement will be included in its entirety and the other information. We appreciate your interest and involvement and your taking time from your schedule to be with us this morning.

[The prepared statement of Mr. Pressler follows:]

SENATOR LARRY PRESSLER (R-SD)
TESTIMONY
HOUSE SUBCOMMITTEE ON HOUSING, EMPLOYMENT AND AVIATION
MAY 19, 1993

Mr. Chairman, I thank you and the members of the Subcommittee for holding this hearing. As you know, my home State of South Dakota suffered a great loss last month when our Governor and seven other well-respected business leaders were killed when their small aircraft crashed. Not long after I first voiced my concern about the Federal Aviation Administration (FAA) investigatory procedures following the April 19th plane crash, I have heard from many individuals who are worried the FAA may no longer put public safety first. I am appalled by the sloppy, lazy, bureaucratic work the FAA has done on this matter!

From the moment I heard about the tragic crash in Dubuque, Iowa, one question has haunted me: Could this accident have been prevented? Initial investigations of this particular crash and its similarities to a previous incident in Utica, New York, indicate that may be the case. On at least two separate occasions, the latest being in March, the National Transportation Safety Board (NTSB) recommended that the FAA conduct a full-fleet inspection of the HC-B4 propeller assembly on all Mitsubishi MU-2B-60 aircraft. In March, NTSB Chairman Carl Vogt warned that the failure of the propeller assembly "could result in a catastrophic accident." Still, however, the FAA concluded that a special investigation was not warranted.

Today, we hear a different story. The FAA did not take action until the Governor of my State and his fellow passengers and pilots lost their lives. There is nothing we can do to bring them back. But there is much we can do as public officials to prevent additional tragedies. My investigation so far reveals that the pattern of behavior displayed by the FAA on such serious safety matters has been going on for decades. Frankly, I am shocked at what I have learned so far.

The situation that has occurred unquestionably must be demoralizing to the many loyal and dedicated employees of the FAA and the aviation industry. I am speaking of those who are genuinely planning and striving to make aviation as safe as it should be. Nevertheless, my fellow South Dakotans and I are very disturbed about the tragedy that occurred. I am here not to point a finger of blame. I hope that the purpose of this hearing is not to vent our anger. It is my hope that through this hearing, we can get to the core of this serious safety problem. As public officials, we have a duty to all citizens in this country who are reliant on our air transportation system and believe that the federal government--in this case the FAA--is performing its duties.

The bottom line is clear: We have two agencies charged with the safety of small aircraft and its passengers. When these two agencies disagree over a safety issue a dangerous form of gridlock occurs. While this disagreement languishes unresolved, those potentially affected are still flying potentially dangerous aircraft. This gridlock may have claimed the lives of eight South Dakotans. Before additional fatalities occur, let's look at the process between these two agencies. Let's change this process for the better. Let's use this hearing to construct a process that will properly attend to the public safety interest and speak the same safety language as the rest of us.

Doing it any other way is not in the interest of our nation's aviation industry, nor the American people. Furthermore, I believe Congress shares a view that our country should be known for the highest standards of aviation safety. To be known for these standards, our nation must be ready and willing to enforce them. To enforce these standards, we must strive for a government that has the will, the desire, and the ability to enforce effectively our nation's basic safety laws. That should be our goal.

VISION SAFE
CORPORATION

Via Federal Express

April 29, 1993

The Honorable Larry Pressler
United States Senate
283 Senate Russell Building
Washington, DC 20510

Dear Senator Pressler,

I have with interest read an article from yesterday's Orange County Register regarding your concerns about aviation safety and the inexcusable foot dragging that goes on at the FAA of not enforcing vital safety regulations in the face of known unsafe conditions. After reading the article, I talked to your Legislative Assistant Ann Waltner and discussed with her the similar concerns of your colleague Senator Inouye and his recent introduction of S-787 (April 19, 1993) which calls on the FAA to enforce its existing safety regulations, to ensure that pilots are able to see to safely control and land their aircraft during emergencies with dense continuous smoke in the cockpit.

It is quite clear that the FAA has a pattern of arbitrarily obstructing and/or procrastinating on the enforcement of some basic safety regulations. The FAA is treating the unsafe conditions of defective propellers and smoke in the cockpit in the same way they were treating the aircraft icing problem. The FAA knew for many years that icing was the cause of several accidents and that there was a simple solution to remedy the unsafe conditions (practiced in other parts of the world). Yet, FAA deliberately let the accidents continue (see attached news article from the Newhouse Wire Service, which appeared the Honolulu Star Bulletin recently)!

Whether the unsafe conditions concern smoke in the cockpit, defective propellers or icing, I stress strongly that NO new regulations are required. What is required however, is that the FAA cease its continuing violation of Federal Safety Laws and instead ENFORCE the exiting safety regulations in accordance with the requirements of the Federal Aviation Act of 1958 as amended, Title VI section 601(b), to prevent the recurrence of accidents and, in accordance with the Federal Aviation Regulations 39.1, which requires the issuance of airworthiness directives when it is determined that unsafe conditions exist (i.e. smoke in the cockpit, propellers, icing). FAA, on the other hand, argues, in a very obstructionist manner that no FAA action is required. Or, if there is, then there is a need for the lengthy process of establishing new FAA regulations. This is not the case. These are merely deliberate FAA obstructions and delays. Enforcement of the existing law is what is required.

G:\WP\FAA\29APR93.SLP

46-217 Kahuhipa Street, Kaneohe, Hawaii • Mailing Address: P.O. Box 5011, Kaneohe, Hawaii 96744-5011 USA • FAX (808) 247-6313
Telephone (808) 235-0849

I commend you for seeking prompt action on these serious safety matters which concern all of us. I hope that any hearing, investigation or legislation that you support will include several other, but equally important, safety issues the FAA is presently deliberately ignoring. Your Legislative Assistant Ann Waltner indicated this to be your desire. (She also appeared to be very knowledgeable on the issues.)

Enclosed herewith is some recent, up to date information on the long and acrimonious dispute with the FAA on the smoke in the cockpit issue, which summarizes the many lineal feet of files we have on the matter. I have also included information on S-787. These documents and issues fully echo your concerns on the propeller issue. If you or your staff have any questions or deem that I can be of further assistance, please do not hesitate to contact me.

Sincerely,

Bert Werjefelt
President

Enclosures

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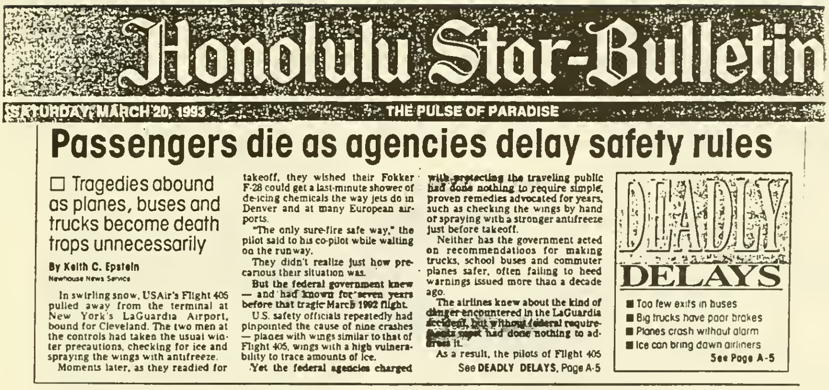

Honolulu Star-Bulletin

SATURDAY, MARCH 20, 1993 THE PULSE OF PARADISE

Passengers die as agencies delay safety rules

☐ Tragedies abound as planes, buses and trucks become death traps unnecessarily

By Keith C. Epstein
Newhouse News Service

In swirling snow, USAir's Flight 405 pulled away from the terminal at New York's LaGuardia Airport, bound for Cleveland. The two men at the controls had taken the usual winter precautions, checking for ice and spraying the wings with antifreeze.

Moments later, as they readied for takeoff, they wished their Fokker F-28 could get a last-minute shower of de-icing chemicals the way jets do in Denver and at many European airports.

"The only sure-fire safe way," the pilot said to his co-pilot while waiting on the runway.

They didn't realize just how precarious their situation was.

But the federal government knew — and had known for seven years before that tragic March 1992 flight.

U.S. safety officials repeatedly had pinpointed the cause of nine crashes — planes with wings similar to that of Flight 405, wings with a high vulnerability to trace amounts of ice.

Yet the federal agencies charged with protecting the traveling public had done nothing to require simple, proven remedies advocated for years, such as checking the wings by hand or spraying with a stronger antifreeze just before takeoff.

Neither has the government acted on recommendations for making trucks, school buses and commuter planes safer, often failing to heed warnings issued more than a decade ago.

The airlines knew about the kind of danger encountered in the LaGuardia accident, but without federal requirements most had done nothing to address it.

As a result, the pilots of Flight 405

See DEADLY DELAYS, Page A-5

DEADLY DELAYS

- Too few exits in buses
- Big trucks have poor brakes
- Planes crash without alarm
- Ice can bring down airliners

See Page A-5

PECIAL REPORT: FEDERAL RED TAPE COSTS LIVES

Stories by Keith C. Epstein, Newhouse News Service

DEADLY DELAYS: People die as federal agencies dawdle

Continued from Page A-1

last March were forced to use outmoded methods of coping with ice on wings. The plane barely lifted before flipping into Flushing Bay in a fiery crash that claimed 27 lives

Passenger Denise Miller watched her father die in a burst of flames Miller, who now uses a wheelchair, asks "How **many plane crashes have to occur? How many people have to die before somebody finally does something?"**

An investigation by The Plain Dealer of Cleveland has found that long after wreckage is examined for clues, causes determined and solutions urged, thousands of Americans still risk death or injury in accidents because the problems weren't fixed.

These deadly delays by federal bureaucrats are not limited to air travel.

Motorists have died because many big trucks have faulty brakes — while for 14 years the government failed to require proven solutions such as anti lock brakes and automatic brake adjusters costing only $204.

Children trapped in school buses when front or rear doors jammed were drowned or burned — while for 19 years the government failed to require an extra emergency exit costing $557.

One firm has offered emergency side doors as an option since the 1950s.

Passengers have died in commuter airliners that crashed on routine approaches to airports — while for 18 years the government failed to require the same low-altitude alarms it mandated for large jets. It would seem to be a bargain for commuters even at $14,600 for each $3 million aircraft.

"The same stupid stuff keeps happening," said retired aviation investigator Rudolf Kasputin. "It's not just frustrating. It makes me want to throw up."

Federal agencies have acted on only two of 18 long-ignored safety concerns identified by the government's National Transportation Safety Board in 1990 as urgently needed improvements that could save nearly 3,000 lives each year.

"Everything takes too long nowadays," said Anthony J. Broderick, the Federal Aviation Administration's associate administrator.

Experts describe a bureaucracy increasingly paralyzed by fear of lawsuits from regulated industries, hobbled in conflicts with other agencies, buffeted by meddling members of Congress and political appointees, and crippled by weak leadership unable to choose priorities or stick to deadlines.

"If the average American knew how things work here, they wouldn't believe it," said Fred Emery, former director of the Federal Register, official publication of government rules. "They'd think it's a god awful mess"

WINGS: Icy aircraft fall as FAA idles

WASHINGTON — It's 1985.

"A hazard exists," federal safety officials write in a confidential internal memo. Certain types of planes are "more sensitive" to accumulations of ice too small for pilots to spot

But the federal government does nothing and, in succeeding years, other ice-sensitive planes fall from the sky, killing 81 people.

Seven years after the 1985 memo, USAir's Flight 405 became the 10th such plane to crash, plunging into icy waters just beyond the runway at New York's LaGuardia Airport, killing 27 people.

The crash is just one example of the deadly cost of bureaucratic delay — the government's failure to react to recurring accidents traced to the sensitivity to ice of the Dutch-made Fokker F-28 and two older models of the McDonnell Douglas DC-9

Barry L. Harris, the Federal Aviation Administration's acting administrator, acknowledges the government's "lumbering lack of responsiveness."

By the time National Transportation Safety Board investigators drafted their 1985 memo, they already had compelling evidence of the unique vulnerability of these planes to frost, ice and snow.

Government officials, manufacturers and aviation experts have long recognized the vulnerability to small amounts of frost, snow or ice on planes without slats — retractable miniwings along the wing's front edge

On any aircraft, ice no thicker than frost on a car windshield can cause a stall by adding weight and altering the flow of air over the normally smooth aerodynamic shape of the wings

Newhouse News Service

Twenty-seven people died as USAir's Flight 405 plunged into Flushing Bay, close to New York's LaGuardia Airport, because of inadequate de-icing of the wings

As early as December 1969, Fokker itself warned owners of its F-28 that ice on the wings was "particularly dangerous," and could prevent the aircraft from lifting, sending it into an uncontrollable roll

Senior officials at the safety board refused to make the memo public and failed to seek the changes suggested by the investigators. In fact, the board failed to make any safety recommendations to the FAA, the agency with the actual authority to order changes.

In November 1987, two years after the safety board's internal memo, an Idaho-bound Continental Airlines flight at Denver waited 27 minutes after de-icing before takeoff When the DC-9 series 10 crashed, killing 28 people, the board no longer doubted the evidence.

In 1988 the National Transportation Safety Board officially began urging stricter de-icing procedures.

But today, more than five years after a Denver crash that killed 28, the FAA still hasn't acte[illegible] safety board's urgent pleas to [illegible]rlines to use a longer-lasting de-icing chemical common in Europe, where in two decades crashes due to wing ice have all but disappeared.

Still, nothing required crews to do what the manual suggested, or to use the longer-lasting antifreeze, and there was no mention of other, ice-sensitive planes — DC-8s and F-28s

The FAA did decide in February 1992 to conduct a survey to identify the other planes — a task agency spokesman Fred Farrar said it "probably" could have been accomplished in an afternoon.

The FAA was still working on its "survey" when USAir's Flight 405 — an F-28 with ice on its wings — crashed on a wintry day last March 22.

Now, well into aviation's most hazardous season the government procrastinates.

The FAA has forced airlines to craft guidelines on how long a plane can sit on a runway in freezing rain or snow after its wings are washed down with antifreeze But nothing requires the pilots to follow mandatory time limits, and an airline can avoid creating time restraints by checking the wings from outside at the last minute.

Mr. PETERSON. I will now proceed with the first panel. We have Mr. Timothy Forte. He is the Director of the Office of Aviation Safety of the National Transportation Safety Board.

Appreciate you being with us this morning. It is the custom of the Government Operations Committee in the hearing process, our investigative hearings, to swear in all witnesses so that we do not discriminate against any of them. So do you have any objection, Mr. Forte, to being sworn in.

Mr. FORTE. None. None at all, sir.

[Witness sworn]

STATEMENT OF TIMOTHY P. FORTE, DIRECTOR, OFFICE OF AVIATION SAFETY, NATIONAL TRANSPORTATION SAFETY BOARD

Mr. FORTE. Thank you. Good morning, Mr. Chairman, members of the subcommittee. The National Transportation Safety Board welcomes the opportunity to appear before the subcommittee today and discuss the relationship between the Safety Board and the FAA.

The Safety Board is the responsible organization for the conduct and control of investigation involving civil aviation accidents within the United States and is the official U.S. representative in accidents having U.S. interest occurring in other countries. The Board does not work in isolation, and the Federal Aviation Act of 1958 provides for the participation of FAA personnel in these investigations. The FAA almost always uses this prerogative and actively participates in the on-scene phase of the investigations.

Because of their participation, the FAA staff are usually aware of the accident circumstances and the direction the Safety Board's investigation is heading much before the formal communication of the safety recommendation process. If the investigation discloses that a safety recommendation is necessary, that recommendation may be classified in one of three ways. Class I "urgent action" is necessary when immediate action to prevent loss of life. Class II "priority action" is not an immediate threat to safety but significant enough to warrant further actions. And class III "longer term" action is that action that would require lengthy research or a change in FAA programs or funding priorities that cannot be accomplished quickly.

Although the Safety Board must consider the real world impact of its recommendations, safety is our primary mandate. The FAA as a rulemaking and regulatory agency has the statutory authority to obligate funds and mandate others to do the same, and therefore the cost in potential public impact must necessarily be more a significant factor for the FAA in its decision.

The Safety Board believes that this, at least in part, was the case in the three safety recommendations issued following the aviation accident that occurred in September 1991 in Utica, NY regarding the Hartzell propeller hub failure of the Mitsubishi MU–2B–60 airplane.

Safety recommendation No. A–92–81 asked the FAA to develop, with Hartzell's assistance, an inspection method capable of detecting hub arm cracks and to issue an airworthiness directive requiring the Hartzell HC–B4 hubs with over 3,000 hours to be inspected. Safety recommendation No. A–92–82 asked the FAA to mandate repeated inspection of the affected hubs, if so warranted by the results of the initial nps. And the third safety recommendation asked the FAA to determine if other similarly designed Hartzell propeller hubs should also be inspected based on the findings of the first two recommendations.

Based on FAA's response, which failed to indicate that it was actively pursuing the development and implementation of a practical inspection program, the Safety Board classified the FAA action as unacceptable on January 6, 1993. Following an additional letter from the FAA, we reiterated that classification on March 4, 1993.

The Safety Board's recommendations and the FAA's responses came to the front following the April 19 accident involving another Mitsubishi airplane operated by the State of South Dakota. The airplane had departed Cincinnati, OH, and was enroute to Sioux Falls, SD, when the pilot reported an emergency situation. The flight was given clearance to the Dubuque, IA, airport, and the airplane crashed 10 miles south of the airport, striking a silo and catching fire. All eight occupants received fatal injuries.

It was immediately evident that a propeller blade from the left engine had been lost in flight. Upon closer examination by the Board's metallurgist, it was found that the characteristics and location of the propeller hub arm fracture were nearly the same as that mentioned in the safety recommendations issued in August 1992. The fracture was indicative of fatigue. The cause for fatigue initiation and propagation is still under investigation. Both of the failed propeller hubs had similar operating times since their manufacturing.

On April 28, 1993, the FAA issues and airworthiness directive requiring that the Hartzell four-blade propellers having 3,000 hours or more operating time installed on Mitsubishi MU–2B–60 airplanes be inspected within the next 10 years in service. The inspection requires that those affected propellers be removed from the airplane and disassembled and that the hubs with pilot tubes in place be sent to the Hartzell facility for further disassembly and inspection.

The Board understands that about 80 of the Mitsubishi MU–2B–60 airplanes are operating in the United States, and nearly 200 propeller assemblies are immediately affected by the inspection requirement. So far approximately 45 percent of these propellers have been inspected. One hub that was inspected had a crack indication that is currently being evaluated, and two propeller hubs were damaged in the inspection process.

The Safety Board concurs with the need for the action taken by the FAA as a result of the April 19, 1993 accident. We believe that until it can be shown that the Mitsubishi MU–2B–60 installation of the Hartzell propeller is unique further actions must be considered. The Board strongly believes that the FAA and Hartzell must expeditiously develop a practical inspection program that can be applied to those airplanes.

The relationship between the Safety Board and FAA is one that has evolved over years from what some felt was historically adversarial to one which is now cooperative. Areas of disagreement over safety recommendations remain and are likely to do so in the future. I would like to point out that about 91 percent of our urgent safety recommendations issued to the FAA are implemented. Overall, about 83 percent of all Board recommendations are eventually acted upon favorably by the FAA. The remaining 17 percent are currently classified as unacceptable. The subject matter is retained in an automated file, and if the Board finds further substantiation for the recommended action as a result of a subsequent accident, the Board will issue a new recommendation presenting these facts and reiterating the need for the action.

That concludes my statement, Mr. Chairman, and I would be pleased to answer any questions you may have.

Mr. PETERSON. Thank you very much, Mr. Forte.

[The prepared statement of Mr. Forte follows:]

National Transportation Safety Board

Washington, D.C. 20594

Safety Information

Testimony of

Timothy P. Forte'

Director, Office of Aviation Safety

National Transportation Safety Board

before the

Subcommittee on Employment, Housing and Aviation

Committee on Government Operations

House of Representatives

regarding the

Relationship of the National Transportation Safety Board

and the Federal Aviation Administration

May 19, 1993

Good morning Mr. Chairman and members of the Subcommittee. The National Transportation Safety Board (NTSB) welcomes this opportunity to appear before the subcommittee today.

The NTSB was established in 1966 as an independent, nonregulatory agency "to promote transportation safety by conducting accident investigations and by formulating safety improvement recommendations." In 1975, the Safety Board's independent status was strengthened and it was made totally autonomous from the Department of Transportation (DOT). And for the first time, the Secretary of Transportation was required to respond to safety improvement recommendations within a specified period of time.

In the case of aviation, the Safety Board is responsible for the organization, conduct and control of the investigation of accidents involving civil aircraft within the United States, and is the official U.S representative in accidents having U.S. interests and occurring in other countries.

The Board does not work in isolation however, and the Federal Aviation Act of 1958 provides for the appropriate participation of Federal Aviation Administration (FAA) personnel in these investigations. The FAA almost always uses this prerogative and actively participates in the on-scene phases of the investigations whether they involve a major air carrier accident or a non-fatal general aviation accident. The communications between the Safety Board staff and the FAA staff begins during the initial stage of the investigation and continues as the post on-scene activity progresses. Because of their participation, FAA staff are usually aware of the accident circumstances and the direction of the Safety Board's investigation much before the formal communication of the safety recommendation process.

If the investigation discloses that the accident resulted from an airworthiness problem that the Board believes could occur on other aircraft and cause a catastrophic accident, the Board may issue a safety recommendation to the FAA for immediate action. The proposed action could be an inspection of similar aircraft within a short time period or even before further flight. In some cases, the FAA recognizes that the situation warrants immediate measures and FAA staff might already have a telegraphic airworthiness directive in preparation or ready for release before the issuance of the Board's recommendation. In other cases, the FAA may not be convinced that immediate actions are needed and the Board will attempt to prompt FAA action with a recommendation that is classified urgent action. This is contained in a formal letter to the Administrator. The FAA generally responds quickly to our recommendations, and about 90 percent of the Board's urgent recommendations are acted upon favorably by the FAA.

In most investigations, the Safety Board observes conditions that could be improved upon in the interest of safety, whether they involve the airworthiness of a particular aircraft, operational procedures, the National Airspace System, air traffic control or other factors. Many of these conditions the Safety Board and staff do not view as an immediate threat to safety, but are significant enough to warrant future actions. The Safety Board will then issue safety recommendations to the Administrator in a more routine manner during the continuing investigation or at the time of consideration of the final report. Safety recommendations may be categorized by the Board as "priority" or "longer term." The latter category, "longer term," is usually assigned for those actions that the Board believes will require changes in FAA programs, funding priorities or extensive research and development; actions that by their nature cannot be accomplished quickly.

Irrespective of the category assigned to a safety recommendation, the FAA modal administrator must acknowledge the recommendation and inform the Board of actions or intended actions within 90 days of receipt of the Board's letter, as prescribed in the Independent Safety Board Act. During this 90-day period and thereafter, informal communication between key Safety Board staff and FAA staff is ongoing. The formal communication continues when the Safety Board receives and evaluates the FAA's formal response to the recommendation. The Safety Board may deem the FAA actions or intended actions as acceptable or unacceptable, and this evaluation will be included in subsequent correspondence to the FAA. If the Board believes that the FAA action fails to meet the intent of the safety recommendation, the Board will attempt to urge the FAA to reconsider its position through both informal staff discussions and formal communication. This will continue until the Board believes that acceptable action has been taken, or, if not, the Board has exhausted its persuasive arguments.

While 91 percent of our "urgent" recommendations are implemented, overall about 83 percent of all Board recommendations are eventually acted upon favorably by the FAA. The remaining 17 percent are classified as unacceptable. The subject matter is retained in an automated file and if the Board finds further substantiation for the recommended action as a result of subsequent accidents, the Board will issue a new recommendation presenting these facts and reiterating the need for action.

Although the Safety Board must consider the real-world impact of its recommendations, lest the recommendations be ignored, safety is our primary statutory mandate. The FAA, on the other hand, also has the statutory authority to spend tax dollars and mandate others to spend their dollars, and the cost and potential public impact must necessarily be a more significant factor for the FAA in its decisions than for the Board.

The Safety Board believes that this, at least in part, was the case in the recommendations involving the Hartzell propeller hub failure on the Mitsubishi MU-2B-60 airplane.

On September 27, 1991, a Mitsubishi MU-2B-60 of Canadian registry, sustained substantial damage when a propeller blade and part of the hub assembly separated in flight near Utica, New York. The airplane was climbing through 19,000 feet when the pilot felt a strong vibration, followed shortly by a loud "bang." The vibration increased and became so severe that the pilots experienced considerable difficulty controlling the airplane. Despite this difficulty, the airplane was successfully landed at the Utica airport with no injuries.

During subsequent metallurgical examination of the recovered portion of the airplane's Hartzell model HC-B4 propeller, the Safety Board found that loss of the propeller blade was the result of fatigue cracking that initiated from the inside diameter surface of one of the arms of the propeller hub. The examination disclosed that the inside diameter surface of the separated hub arm contained scratch marks that extended over about one-half of the hole wall circumference and from the fracture surface to a position slightly inboard of the plane of the fracture. The fatigue origin area was located within this area of scratches.

Examination of the three remaining intact arms after removal of the pilot tubes disclosed evidence of scratch marks similar to those found on the separated arm.

The separated propeller hub was manufactured in 1977 and was overhauled in 1983 and 1988. Records from the first overhaul are not available. The records from the second overhaul indicate that two of the four pilot tubes had been replaced at that time. Because similar scratches were found on all four hub arms, the Board believed it unlikely that the scratches were introduced during the more recent overhaul. Also, the scratches extended inboard of the position contacted by the pilot tubes, and it is unlikely that removal or insertion of the tubes could create such damage. The Safety Board believes it possible that the scratches were produced during original manufacturing of the hub.

The Safety Board noted that the Hartzell HC-B4 propeller hubs and those of similar design, a total of 35,000 hubs, some of which have been in service for 30 years and have accumulated more than three times the operating life of the failed hub, have had no previous hub failures. Nonetheless, the Board was concerned that the fatigue crack in the failed hub might have been attributable to scratches that were present since the time of manufacture and that other propeller hubs in service could have similar damage and thus be susceptible to failure. The Safety Board also recognized that the inspections prescribed for the propeller hub in the Hartzell service manual were not adequate to detect the initiation of a crack in the area noted. The Board noted that an inspection technique that would require removal of the hub-to-blade pilot tubes from the hub arms would be costly and would present some risk of introducing new damage during the disassembly and reassembly process. The Safety Board believes that an inspection method, possibly using ultrasonic technology, could be developed to detect propeller hub arm cracks without necessitating removal of the pilot tubes.

Because of the concern of possible hub failures involving the Hartzell propeller and the knowledge that service manual inspections were inadequate, the Safety Board issued three safety recommendations to the FAA on August 12, 1992.

Safety recommendation A-92-81 asked the FAA to develop, with Hartzell's assistance, an inspection method capable of detecting hub arm cracks and to issue an airworthiness directive (AD) requiring that HC-B4 hubs with over 3,000 hours be inspected. Safety recommendation A-92-82 asked the FAA to mandate repeated inspections of the affected hubs, if so warranted by the results of the initial inspections. Safety recommendation A-92-83 asked the FAA to determine if other similarly designed Hartzell propeller hubs should also be inspected for cracking.

The FAA responded to the recommendation letter on October 26, 1992, indicating that the staff was reviewing the service history of the Hartzell propeller hubs to determine the magnitude of the problem and what changes are needed to the service manuals. Based on the FAA's response, which failed to indicate that it was actively pursuing the development and implementation of a practical inspection program, the Safety Board classified the FAA action as unacceptable and reiterated its concern in a January 6, 1993, letter to the Administrator.

Another letter from the FAA was received that same day, January 6, 1993, that amplified the prior October response. In this letter the FAA stated that, while agreeing with the intent of the safety recommendations, there were no immediate plans for issuance of an Airworthiness Directive based on the service history showing millions of flight hours of over 28,000 Hartzell steel hubs with only one failure. The FAA noted that Hartzell was conducting extensive analysis to verify propeller hub stress levels. The Safety Board on March 4, 1993, once again noted that the FAA was not responsive to the recommendations and encouraged the FAA to develop an inspection method that could effectively detect flaws in the propeller hub without removal of the pilot tubes. In that letter, the Board noted that separation of a blade from a Hartzell HC-B4 propeller on another airplane could result in a catastrophic accident.

The Safety Board's recommendations and the FAA's responses took on additional interest following the April 19, 1993, accident involving another Mitsubishi MU-2B-60 airplane operated by the State of South Dakota.

The airplane had departed Cincinnati, Ohio, and was enroute to Sioux Falls, South Dakota, with two pilots, three businessmen, Governor George Mickelson, and two South Dakota State Commissioners aboard when the pilots reported an emergency situation. The flight was given clearance to the Dubuque, Iowa, airport. The airplane crashed about ten miles south of the airport, striking a silo and catching fire. All eight occupants received fatal injuries.

As stated previously, the Safety Board is mandated to investigate civil aviation accidents only. This airplane was a public use aircraft owned by the State of Dakota; however, the Safety Board was asked by the State of South Dakota to conduct the accident investigation. It was immediately evident that a propeller blade from the airplane's left engine had been lost in flight. Upon closer examination by the Board's metallurgist, it was found that the characteristics and location of the propeller hub arm fracture were nearly the same as the previously noted hub failure in September 1991. The fracture was indicative of fatigue. The cause for fatigue initiation and propagation is still under investigation. Both of the failed propeller hubs had similar operating time since manufacture.

The second Hartzell HC-B4 propeller hub failure prompted more positive action from the FAA. A priority letter Airworthiness Directive was issued on April 28, 1993, requiring that all Hartzell HC-B4 propellers having 3,000 hours or more operating time installed on Mitsubishi MU-2B-60 airplanes be inspected within the next ten hours time in service. The inspection requires that those affected propellers be removed from the airplane and disassembled, and that the hubs with pilot tubes in place be sent to the Hartzell facility for further disassembly and inspection. If the inspection is satisfactory, new pilot tubes are inserted by Hartzell and the hub assembly is sent back to the operator.

The Board understands that about 80 MU-2B-60 airplanes are operating in the United States. Nearly 200 propeller assemblies are immediately affected by the inspection requirement. So far, about 40 percent of these propellers have been inspected. One of the hubs that was inspected had a crack indication that is currently being evaluated, and two propeller hubs have been damaged in the inspection process and had to be replaced.

The Safety Board concurs with the need for the action taken by the FAA as a result of the April 19, 1993, accident.

The Safety Board believes that, until it can be shown that the MU-2B-60 installation of the Hartzell HC-B4 propeller is unique, further actions must be considered. The Board strongly believes that the FAA and Hartzell must expeditiously develop a practical inspection program that can be applied to those airplanes.

NTSB accident reports and safety recommendations emanating from the accident investigations receive significant attention in the public and the private sector. In fact, it is the NTSB's policy to make public information about its investigations and safety recommendations to the maximum extent possible.

For accidents investigated by the Safety Board, a public docket is created that contains factual information and supporting documentation and the NTSB's report reflecting the determination of probable cause.

The NTSB meetings on major accident reports are attended by public and private persons with an interest in the subject matter, and the safety studies and safety recommendations generated by those reports are widely reported in the print and broadcast media.

In an effort to broaden awareness of Safety Board activities, news releases are also issued on all major reports, and free subscriptions to a monthly NTSB News Digest are made available to the public.

The relationship between the Safety Board and the FAA is one that has evolved over the years from what some felt was historically adversarial, to one which is now more cooperative. Areas of disagreement over safety recommendations remain and are likely to do so in the future.

That concludes my statement and I would be pleased to answer any questions you may have.

Mr. PETERSON. Without objection, I would like to put into the record a group of documents that the subcommittee has received from NTSB, from the FAA, and from Hartzell Propeller. Mr. Forte, a copy is on the table for your use, as I will be referring to them from time to time. They have been placed in chronological order, so hopefully you can refer to them.

[The information follows:]

B4

[illegible] # [illegible]
11/[illegible]

National Transportation Safety Board

Memorandum

Date: October 25, 1991

To: Director, Office of Safety Recommendations
Thru: Director, Office of Aviation Safety

From: Director, Northeast Region

Subject: Safety Recommendation Proposals by Charles F. Leonard

The enclosed Safety Recommendation Proposals requests the Federal Aviation Administration to issue the following:

1. An EMERGENCY Airworthiness Directive (AD) for a visual inspection of specific Hartzell propeller hub arms, due to a recent failure of a hub arm as a result of fatigue caused by corrosion.

2. Upgrading of two service bulletins to AD's pertaining to single and double shoulder aluminum propeller blades manufactured by Hartzell Propeller Inc. These blades continue to separate as the result of fatigue caused by corrosion.

Barry L. Trotter
Regional Director

11/1/91

NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF AVIATION SAFETY
NORTHEAST REGIONAL OFFICE

SAFETY RECOMMENDATION PROPOSAL

A. ACCIDENT: NYC91-L-A250

Location: Utica, New York
Date : September 27, 1991
Aircraft: Mitsubishi MU-2B-60, C-FFSS
Owner : Air 500 Limited
Ontario, Canada

B. NATURE AND CIRCUMSTANCES SURROUNDING THE ACCIDENT

On Friday, September 27, 1991, at 1330 eastern daylight time, a Mitsubishi MU-2B-60, Canadian registry C-FFSS. sustained substantial damage when a propeller blade separated in flight near Utica, New York. The airplane was climbing through 19,000 feet when the pilot felt a strong vibration, followed very shortly by a loud "bang". The vibration became severe and the pilot experienced significant difficulty controlling the airplane. The pilot was able to land the airplane at the Utica Airport.

A post accident examination of the airplane revealed that one of the four the propeller blades on the no. 2 engine ripped a 12 inch hole in the pressurized area of the fuselage. The airplane wings were substantially twisted and wrinkled, and the no. 2 engine nacelle was partially separated from the engine truss mount.

The pilots stated that the vibration was so severe that they were "barely able to control the airplane."

The failure occurred at the propeller hub arm, which resulted in the entire blade and blade clamp assembly separating. The separated blade struck the next blade in rotation, causing about 6 inches of that blade's tip to separate.

C. DISCUSSION

The Hartzell propeller hub on the airplane was model HC-B4TN-5DL. This is the first known failure of a steel hub arm manufactured by Hartzell Propeller Inc.. It is estimated that as many as 1000 airplanes use this basic hub. Some of these airplanes are: King Air A-100, B-100; Donnier 228; Fairchild 226T; Mitsubishi MU-2-26, 36, 40, 60.

The metallurgical examination of the propeller hub was conducted at the National Transportation Safety Board Metallurgical Laboratory in Washington, DC, on October 22, 1991. This examination revealed that the hub arm failed as a result of fatigue which initiated in the internal bore of the hub arm assembly. This fatigue was from multiple origin sites and most likely caused by corrosion pitting on the surface of the internal bore near the end of the pilot tube.

As a result of the aforementioned accident and the potential for future accidents; and due to the large number of airplanes fitted with these Hartzell propeller hubs, it is imperative that an inspection of these hubs be accomplished.

D. RECOMMENDATION

Therefore, it is proposed that the National Transportation Safety Board recommends to the Federal Aviation Administration that:

1. An EMERGENCY Airworthiness Directive be issued requiring a one-time visual inspection of the hub arms of the following Hartzell propeller hubs:

HC-B4TN
HC-B4MN
HC-B4MP

Charles Leonard
Charles F. Leonard
Air Safety Investigator

Procedures For One Time Hub Inspection

1)

Remove propeller from aircraft and move to an approved propeller repair facility for disassembly and inspection. (Note, not all propeller facilities are equipped to remove hub pilot tubes.)

2)

Disassemble propeller per applicable instructions. Note, a near total disassembly would be required with minor exceptions such as feathering spring assembly, blade bore bearings, etc., as would be required for a propeller overhaul.

3)

With suitable tooling and per Hartzell instructions, remove and discard the hub pilot tubes (one per each installed blade). Note, removal of pilot tubes could cause some hubs to become "scrap" since removal process could cause "over-sizing" of the bore. Average cost of new hub would be about $3,000.

4)

With suitable equipment, eg. borescope, inspection mirror and light etc., inspect each pilot tube bore for corrosion, tool marks and cracking.

5)

Correct any defects per Hartzell recommended procedure (TBD).

6)

Measure pilot tube bores and select the appropriate new pilot tubes, and reinstall per Hartzell recommended procedures. Note, approximate cost of new pilot tube is $135.00 each.

7)

Reassemble propeller as per applicable instructions.

8)

Complete applicable paperwork and log book entries.

Cost Considerations:

Rough estimate of work required would be about $660.00 MINIMUM, not including removal and reinstallation of propeller nor any additional part requirements.

For your information, Hartzell has manufactured about 27,600 3-way, 6,210 4-way, and 1,345 5-way steel turbine hubs since 1968. (Steel hub turbine model props began manufacture in about 1963, but data not readily available back to that date.) This would equate to about 114,365 replacement pilot tubes or $15,429,275 in pilot tubes alone!

Mr Drake April, 1, 97

Reference Log 2328

This involves the failure of a propeller hub arm due to fatigue which initiated in the internal bore of the hub where the ~~hub~~ blade pilot tubes are installed. As indicated in in the letter, ~~it would~~ from Hartzell, it would require an almost total disassembly of the propeller to gain access to the problem area. It would be necessary to remove the pilot tubes for this inspection, and after sutable dimensional inspections, ~~and~~ install new hub pilot tubes. A one time inspection would not be sufficent, as corrosion can form after the inspection; therefore, a sutable time inspection period would be required. The reported history of this type of event indicate that this is the first event of an internal bore failure of the hub arm in over 35,000 hubs.

The complexities associated with the type of inspection, the absence of any previous history of failures and the logistics problems associated with the inspection suggest that the inspections are not feasible; however, Mr Wilday is presently investigating the failure and has not completed the report. His findings and suggestions for inspection methods should be considered. Based on present info, an inspection is not warrented; prehaps Mr Wildey may have alternatives; It is suggested that this recommendation be held or turned over to Mr Wildey/Mr Marx. This was discussed with Mr Marx and he agreed to accept the recommendation if you wish to release it.

Ed Wyrick

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Washington, D.C. 20594

OFFICIAL USE ONLY

May 7, 1992

Materials Laboratory
Report No. 92-50A

METALLURGIST'S ANALYSIS REPORT

A. ACCIDENT

Place : Utica, New York
Date : September 27, 1991
Aircraft : Mitsubishi MU-2, CFFSS
NTSB No. : NYC 91-L-A250
Investigator: Chuck F. Leonard (NER-A)

B. COMPONENTS EXAMINED

Propeller hub (referred to as a hub spider), P/N D-3405-1, with a separated hub arm. Also submitted were the three recovered pilot tubes, P/N A-1891 or A-1891-( )A that had been removed from the intact arms of the hub spider. The separated portion of the hub arm and the pilot tube from this arm were not submitted and are assumed to be lost. The hub spider and the pilot tubes together make the hub spider unit, P/N 840-91. The hub spider unit was part of a Hartzell propeller, Model Number HC-B4TN-5, installed on a Garrett TPE-310-10 engine.

C. DETAILS OF THE ANALYSIS

Separation of the hub arm was the result of fatigue cracking that initiated from multiple initiation sites on the inside diameter surface of the arm. The origin area was located in an area approximately corresponding to the inserted end of the pilot tube. This area would be subjected to a slight stress peak associated with the end of the pilot tube, and this may have served to determine the axial location of the origin area.

General corrosion damage and corrosion pitting were noted on the inside diameter surface from which the fatigue cracking initiated. However, the scanning electron microscope examination of the fracture did not reveal any evidence of corrosion pits associated with the individual initiation sites. Very small corrosion pits (less than 0.001 inch deep) may have been obscured by the mechanical damage to the corner between the fracture and the inside diameter surface.

The metallurgical examination revealed no other defects in the microstructure, hardness, or material that may have contributed to the initiation of fatigue cracking.

The Hartzell dimensional examination of the hub revealed that one of the intact hub arms had an outside diameter that was below the specified minimum dimension in localized areas. Such a condition is consistent with grinding repair of corrosion on the exterior surface. There is no evidence to indicate that a similar repair was performed on the separated arm. Even if such a repair had been performed, the stress on the inside diameter surface would only marginally increase because the repair is on the outside of the hub arm.

When the hub assembly components were received in the Materials Laboratory, the pilot tubes had already been removed from the three intact hub arms. The examination of the inside of these holes revealed a spiral scratch mark pattern, as shown in figure 9 of the Factual Report. A representative of Hartzell indicated that, as part of the propeller tear down, the pilot tubes had been pulled straight out of the arms, with little or no twisting of the pilot tubes relative to the hub. Also, the spiral scratch marks extended into the hub arm holes to a depth greater than the contact area of the pilot tube. For these reasons, it is unlikely that the spiral scratch marks were created during the recent removal of the pilot tubes. It is much more likely that the marks were created during original manufacturing of the hub. A representative of Hartzell indicated that the inside diameter surface of the hub arm hole is "rolled" after it is drilled. The spiral scratch marks may have been created at this time.

Aerodynamic loads on each propeller blade can be divided into three types: radial outward loads from the centrifugal motion, loads in the direction opposite of rotation from drag, and loads in the forward direction from thrust. For the hub arms, the centrifugal loads dominate, resulting in tensile stresses throughout the shank portion of the arm where the fatigue initiated. The thrust and drag loads on the blades introduce bending stresses into the hub arms. Normally, these bending loads would be expected to increase the amount of tension in the aft and leading edge sides of the hub arms, and decrease the amount of tension in the forward and trailing edge sides of the arms. However, the circumferential location of the fatigue origin area was the forward - trailing edge side of the separated arm.

The inside diameter surface of the separated hub arm contained slight mechanical damage and general corrosion adjacent to the fracture origin area. Despite the presence of this damage, some evidence of scratch marks similar to those found on the intact arms was noted (see figures 3 and 4 of the Factual Report). It is possible that scratch marks were present at the origin area and that these marks increased the local stress level sufficiently to precipitate cracking and caused the

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fatigue origin area to be located where it was instead of in the more highly stressed area (the aft - leading edge side of the hub arm). Other unknown conditions, such as an unusual vibration, may also have contributed to fatigue crack initiation.

D. RECOMMENDATIONS

The scratch marks or other conditions that contributed to initiation of the fatigue cracking may be present in additional hubs. Therefore, a once-through-the-fleet inspection is necessary to determine if any other hubs contain cracks. Since the inside diameter surface is not viewable without removal of the pilot tubes, a penetrant inspection may not be feasible. However, an ultrasonic inspection from the end of the hub arm could be developed to detect cracking of the type that led to the separation of the hub arm. Should additional cracked hubs be located, a repetitive inspection program may be necessary.

James F. Wildey II
James F. Wildey, II
National Resource Specialist - Metallurgy

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Washington, D.C. 20594

May 7, 1992

Materials Laboratory
Report No. 92-50

METALLURGIST'S FACTUAL REPORT

A. ACCIDENT

Place : Utica, New York
Date : September 27, 1991
Aircraft : Mitsubishi MU-2, CFFSS
NTSB No. : NYC 91-L-A250
Investigator: Chuck F. Leonard (NER-A)

B. COMPONENTS EXAMINED

Propeller hub (referred to as a hub spider), P/N D-3405-1, with a separated hub arm. Also submitted were the three recovered pilot tubes, P/N A-1891 or A-1891-( )A that had been removed from the intact arms of the hub spider. The separated portion of the hub arm and the pilot tube from this arm were not submitted and are assumed to be lost. The hub spider and the pilot tubes together make the hub spider unit, P/N 840-91. The hub spider unit was part of a Hartzell propeller, Model Number HC-B4TN-5, installed on a Garrett TPE-310-1C engine.

C. DETAILS OF THE EXAMINATION

The propeller hub is shown in figure 1, in a view looking primarily aft at the front face of the hub. The unlabeled arrow in this figure indicates the fracture surface on one of the hub arms.

The fracture surface on the hub arm is shown in figure 2. Information supplied by a representative of Hartzell indicated that the hub rotates counter clockwise, aft looking forward (in the direction indicated by the "Rotation" arrow in figure 2). Each hub arm contains a drilled hole into which a pilot tube is interference fit.

A portion of the fracture was smooth and contained crack arrest markings typical of fatigue cracking. The fracture features in the fatigue region emanated from a broad origin area on the inside diameter surface of the arm, at the location indicated by bracket "O" in figure 2. The center of the origin area was approximately at the 2:00 position on the inside diameter surface, assuming that the 12:00 position is forward and the 3:00 position is the trailing edge of the hub arm.

As can be seen in figure 2, a portion of the fatigue region around the origin area was darkly discolored. The fatigue features extended beyond the darkly discolored zone, up to the dashed line positions. Fracture features beyond the positions indicated by the dashed lines were typical of a final overstress region stemming from the terminus of the fatigue region.

The fatigue origin area was located 0.8 inch from the end of the pilot tube hole wall. A comparison of the required insertion depth of a pilot tube with the depth of a pilot tube hole indicated that the fatigue origin area was located at a position approximately corresponding to the inserted end of the pilot tube.

A portion of the hub containing the fatigue origin area was saw cut from the remainder of the component. Detailed visual examination of the origin area on the fracture was hindered by the presence of extensive deposits. Also, the inside diameter surface of the hub contained rust-colored corrosion deposits in the area from which the fatigue cracking initiated. The corrosion-damaged area on the inside diameter surface of the separated hub arm is shown at two magnifications in figure 3. What appeared to be nearly circumferential scratch marks were visible in areas without corrosion damage as well as in some of the corrosion damaged areas.

In order to remove the corrosion deposits and to clean the fracture surface, the origin area piece was electrolytically cleaned in Endox 214, a commercially available cleaning compound. Figure 4 shows the inside diameter surface after cleaning. The photograph in this figure shows approximately the same area and is at the same magnification as the lower photograph in figure 3. The unlabeled arrow in figures 3 and 4 indicates a large corrosion pit on the inside diameter surface.

Two enlarged views of the cleaned fracture surface in the vicinity of the origin area are shown in figure 5. Multiple ratchet marks were noted throughout the origin area, indicating the presence of multiple individual initiation sites. The orientation of the rachet marks indicated that the individual initiations sites were arranged in two adjacent but independent origin areas as indicated by brackets "O1" and "O2" in figure 5. The largest ratchet mark, indicated by arrow "R", separated the two origin areas.

A scanning electron microscope (SEM) was used to examine the piece cut from the separated arm. The corner between the fracture and the inside diameter surface of the hub arm was found to contained slight mechanical damaged throughout the origin area. This damage was consistent with minor contact with the end of the pilot tube during final separation of the hub arm. Figure 6 shows the damage area in the vicinity of origin area "O2". The opposing arrowheads in this figure denote the mechanical damage from contact with the end of the pilot tube. This contact deformed the fracture a maximum amount of 0.001 inch away form the inside diameter surface. General corrosion attack was noted on the inside diameter surface adjacent to the origin area; however, no evidence was found to indicate that the mechanical damage area obscured corrosion pits, or that corrosion pits were associated with the individual origin sites.

Figure 7 shows the condition of the inside diameter surface at the location approximately directly opposite from the origin area. Isolated corrosion pits were noted in this area as well as on the other portions of the inside diameter surface of the separated hub arm. Visual examination revealed no evidence of cracking associated with any of these pits. It was also noted that about one half of the inside diameter surface, centered on the area shown in figure 7, appeared to have been lightly sanded with very fine sandpaper.

A metallographic section through the approximate center of origin area "O1" was mounted and prepared for examination. Section lines "X-X" in figure 5 indicate the location and direction of viewing of this section. Figure 8 shows the as-polished section at the corner of the fracture and the inside diameter surface. The slight mechanical damage associated with contact with the pilot tube is indicated by the bracket in this figure. Etching of the section revealed a microstructure consisting of tempered martensite. No unusual microstructural features were noted in the material at the origin area.

Microhardness measurements were taken on the section "X-X". These measurements ranged from 34 to 37.5 HRC (DPH) and averaged 36 HRC (DPH). The specified hardness range for the hub is 36 HRC to 39 HRC. X-ray energy dispersive spectroscopy of section "X-X" generated spectra consistent with the specified 4340 steel alloy material.

Examination of the intact hub arms revealed the presence of spiral scratch marks on one side of the inside diameter surface of the hole in each of the arms. In order to better examine the interior of one of the intact arms, radial saw cuts were taken through the hub at the locations indicated by the dashed lines in figure 2. As can be seen in figure 9, the spiral scratch marks extended into the hub arm holes to a position slightly inboard of the position corresponding to the end of the pilot tube.

At the request of the Materials Laboratory, Hartzell Propeller Inc. performed a dimensional inspection of the hub spider. No discrepancies were found on the portion of the separated arm available for testing. However, it was noted that the outside diameter of one of the intact arms was as much as 0.040 inch smaller than the specified minimum in localized areas, indicative of some type of grinding repair to the outer surface. Also. the bearing seat area on the hub arm flange of the three intact arms did not conform to the inspection template for this area.

James F. Wildey II
James F. Wildey, II
National Resource Specialist - Metallurgy

B5

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NATIONAL TRANSPORTATION SAFETY BOARD

NOTATION

5798

NOTATION MEMORANDUM

DATE: JUL 2 1992

TO : The Board

THRU : The Managing Director

FROM : Director, Office of Research & Engineering

SUBJECT: Recommendations to FAA Regarding Cracking in Hartzell 3-, 4-, and 5-Bladed Propeller Hubs Used on Twin-Engine Airplanes. (Log 2328)

Background Discussion

The proposed recommendations are the result of the staff's investigation of an incident involving a Mitsubishi MU-2B-60 twin-engine airplane using four-bladed propellers manufactured by Hartzell Propeller, Inc. Severe vibration was experienced when one of the blades from the right engine was lost as a result of a fracture of one of the propeller hub arms. Although the airplane landed safely and no injuries were reported, the control surfaces and the structure of the right wing were damaged and the departing blade created a 12-inch hole in the fuselage skin. Such an occurrence could cause a catastrophic accident, from structural damage created by penetration of the fuselage by the separated blade, or from loss of control as a result of the severe vibration.

Although the separation of this hub arm is the first such occurrence reported, the fatigue crack that led to the separation was precipitated by scratches that were probably produced during original manufacturing of the hub. Therefore, other similarly manufactured hubs could also have the same type of scratches and be susceptible to fatigue fracture.

The accident occurred in September 1991; however, Hartzell has not yet developed an inspection method suitable for detecting cracks on the inside diameter surface of the hub arms. Hartzell recommends overhaul of propellers of this type every 5 years or 3,000 hours, whichever comes first. Staff believe that this time frame is too long to wait for the proposed inspection.

Hartzell has made over 6,000 HC-B4 propeller hubs. Currently, there are as many as 1,000 airplanes (including the King Air A-100 and B-100, the Donnier 228, the Fairchild 226T, and the Mitsubishi MU-2-26, -36, -40 and -60) that use this hub.

Safety Issues

Separation of certain models of Hartzell propeller hubs, resulting in potentially catastrophic damage to the airplane.

Previous Board Action

None.

Recommendations

Three recommendations are proposed to the FAA concerning inspections of Hartzell propeller hubs.

Party Information

A limited investigation of the incident was performed. No Safety Board investigator directly viewed the damaged airplane. Hartzell Propeller, Incorporated; Transportation Safety Board of Canada; and the FAA participated in the early stages of the metallurgical examination. In addition, the manufacturing facilities of Hartzell were visited. and Hartzell has provided information to the Safety Board concerning the hub design, manufacturing processes, and other issues.

Staff

Jim Wildey (RE-30, 382-6696), Writer
Charles Leonard (NER-A, 8-349-6420), Investigator, Proposer
Kay Sommerfeld (RE-1, 382-6760), Editor
Typing Information: hub.rec wp/wilj, hub.not wp/wilj

Bernard S. Loeb
Dr. Bernard S. Loeb

I concur:

W. G. Laynor
Director, Office of Aviation Safety (AS-1)
6-30-92
Date

Director, Office of Safety Recommendations (SR-1)
6-26-92
Date

for Ronald S. Battocchi
Office of General Counsel
6-30-92
Date

for

Honorable Thomas Richards
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Richards:

On September 27, 1991, a Mitsubishi MU-2B-60, Canadian registry C-FFSS, on a cargo flight, sustained substantial damage when a propeller blade separated in flight near Utica, New York. The airplane was climbing through 19,000 feet when the pilot felt a strong vibration, followed shortly by a loud "bang." The vibration increased and became so severe that the pilots experienced considerable difficulty controlling the airplane. Despite this difficulty, the airplane was successfully landed at the Utica airport, with no injuries.

Postaccident examination of the airplane revealed that one of the four arms of the propeller hub for the No. 2 engine had separated, releasing one of the four propeller blades in flight. The released blade hit and damaged an adjacent blade on the same engine and ripped a 12-inch hole in the pressurized portion of the fuselage. The severe vibration resulting from loss of the blade caused substantial twisting and wrinkling of the wings and a partial separation of the No. 2 engine nacelle from the engine truss mounts. The released blade and associated blade clamp, pilot tube, and separated portion of the hub have not been recovered.

Metallurgical examination of the broken Hartzell propeller hub, model HC-B4TN-5DL, was conducted at the Safety Board's materials laboratory. The hub arm fracture was located about 2.3 inches inboard of the outboard end of the hub arm. The fracture was caused by a fatigue crack that initiated from multiple sites on the inside diameter surface of the arm and progressed through 70 percent of the arm cross section before final separation. The fatigue crack initiation area was approximately in line with the inboard end of the pilot tube that is assembled into the hub arm bore with an interference fit. During operation of the propeller, a slight stress increase is expected to occur at the position corresponding to the assembled inboard end of the pilot tube, and this may have caused the fatigue origin area to be located at this radial position.

The inside diameter surface of the separated hub arm contained scratch marks that extended over about one-half of the hole wall circumference and from the fracture surface to a position slightly inboard of the plane of the fracture. The fatigue origin area was located within this area of scratches. Examination of the three remaining intact arms after removal of the pilot tubes disclosed evidence of scratch marks similar to those found on the separated arm.

As the propeller rotates, the predominant load experienced by the hub arm is from the centrifugal loads on the propeller blades. These loads result in radial tension throughout the hub arm. In addition, drag and thrust loads on the blades produce bending in the hub arms. During normal operation (in forward propeller thrust), these bending loads result in maximum tension in the aft leading-edge quadrant of the hub arm. During reverse thrust, the maximum tension would be in the forward leading-edge quadrant of the hub arm. However, the fatigue origin area was not located in either of these quadrants, but was, instead, found in the forward trailing-edge quadrant of the hub arm, suggesting that the circumferential location of the fatigue initiation region was not influenced by bending loads but may have been determined by local stress raisers such as the scratches on the inside diameter surface of the separated hub arm.

The separated propeller hub was manufactured in 1977 and was overhauled in 1983 and 1988. Records from the first overhaul are not available. The records from the second overhaul indicate that two of the four pilot tubes had been replaced at that time. Because similar scratches were found on all four hub arms, it is unlikely that the scratches were introduced during the more recent overhaul. Also, the scratches extended inboard of the position contacted by the pilot tubes, and it is unlikely that removal or insertion of the tubes could create such damage. However, the scratches could have been created by some manufacturing or repair process any time that the pilot tubes were not present in the hub arms. The Safety Board believes it more likely that scratches were produced during original manufacturing of the hub.

General corrosion damage and corrosion pitting were also noted on various portions of the inside diameter surface of the remaining portion of the separated hub arm, including the area from which the fatigue cracking initiated. The general corrosion damage had partially obliterated the scratches from the inside diameter surface. Scanning electron microscopic examination of the fracture revealed no evidence of corrosion pits at the individual fatigue initiation sites, indicating that corrosion may not have substantially contributed to initiation of the fatigue cracking.

The Safety Board believes that it is more likely that the fatigue cracking on the separated hub initiated from the scratches than from corrosion damage. Regardless of the cause of initiation, the failure of a hub arm on a HC-B4 propeller hub could result in a catastrophic accident.

The separated hub, model HC-B4TN-5DL, had accumulated a total of 4,432 hours of operation since new. Information provided by Hartzell indicated that the highest time model HC-B4 propeller hub (manufactured since the 1960s) has accumulated about 15,000 hours of operation. The Safety Board believes that all HC-B4 Hartzell propeller hubs that have accumulated 3,000 hours should be subjected to a one-time inspection for cracks. Hartzell recommends that the HC-B4 propeller be overhauled every 5 years or 3,000 hours, whichever comes first. Performing the hub inspection at the next recommended overhaul could allow passage of too much time before the inspection is performed. Therefore, the Safety Board believes that the hubs should be inspected the next time that the propeller assembly is overhauled, but no later than the next annual inspection. If the inspection of these hubs reveals additional hubs with cracks, then periodic inspections of the HC-B4 hubs may also be necessary.

The interference fit between the pilot tube and the hub arm increases the possibility that removal and reassembly of the pilot tubes (to do a direct inspection of the inside diameter surface of the hub arms) could damage the hole wall. However, the Safety Board believes that hub arm cracks could be detected without removal of the pilot tubes through the use of an inspection method such as ultrasonic inspection.

The design of the HC-B4 hub and the manufacturing processes used to make it are very similar to the design and processes used to make the Hartzell three-bladed hub (basic model HC-B3) and the Hartzell five-bladed hub (HC-B5). Hartzell has made more than 27,000 three-bladed hubs and more than 1,300 five-bladed hubs. Because of the potential similarities between the types of hubs, the Safety Board is concerned that hubs of the three- and five-bladed design could also be susceptible to cracking because they could have damage similar to the scratch marks and corrosion found on the separated four-bladed hub. A failure of a hub arm on a three- or five-bladed hub could also result in a catastrophic accident, and the Safety Board believes that inspections of these hubs may also be necessary to determine if they have a cracking problem.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

1. Develop, with the assistance of Hartzell Propeller, Incorporated, a nondestructive inspection technique capable of detecting hub arm cracks stemming from the inside diameter surface of the hub arm at the approximate location of the inserted end of the pilot tubes on Hartzell model HC-B4 propeller hubs, and issue an airworthiness directive requiring that HC-B4 hubs with 3,000 hours be inspected

using this technique the next time the propeller assembly is overhauled for any reason, or at the next annual inspection, whichever is first. (Class II, Priority Action) (A-92-)

2. Determine, based on the results of the inspections requested in Safety Recommendation A-92-XX [1], if the hub arms on Hartzell model HC-B4 propeller hubs with 3,000 hours should be inspected at periodic intervals. If such inspections are warranted, issue an airworthiness directive, as appropriate, requiring periodic inspections. (Class II, Priority Action) (A-92-XX)

3. Determine if Hartzell model HC-B3 and -B5 propeller hubs, based on similarity of design and fabrication processes with the HC-B4 propeller hub, should be inspected for cracking in the hub arms. (Class II, Priority Action) (A-92-XX)

By: Susan M. Coughlin
Acting Chairman

(Members concurrence)

National Transportation Safety Board
Washington, D.C. 20594

Safety Recommendation

Date: August 13, 1992
In reply refer to: A-92-81 through -83

Honorable Thomas C. Richards
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On September 27, 1991, a Mitsubishi MU-2B-60, Canadian registry C-FFSS, on a cargo flight, sustained substantial damage when a propeller blade separated in flight near Utica, New York. The airplane was climbing through 15,000 feet when the pilot felt a strong vibration, followed shortly by a loud "bang." The vibration increased and became so severe that the pilots experienced considerable difficulty controlling the airplane. Despite this difficulty, the airplane was successfully landed at the Utica airport, with no injuries.

Postaccident examination of the airplane revealed that one of the four arms of the propeller hub for the No. 2 engine had separated, releasing one of the four propeller blades in flight. The released blade hit and damaged an adjacent blade on the same engine and ripped a 12-inch hole in the pressurized portion of the fuselage. The severe vibration resulting from loss of the blade caused substantial twisting and wrinkling of the wings and a partial separation of the No. 2 engine nacelle from the engine truss mounts. The released blade and associated blade clamp, pilot tube, and separated portion of the hub have not been recovered.

Metallurgical examination of the broken Hartzell propeller hub, model HC-B4TN-5DL, was conducted at the Safety Board's materials laboratory. The hub arm fracture was located about 2.3 inches inboard of the outboard end of the hub arm. The fracture was caused by a fatigue crack that initiated from multiple sites on the inside diameter surface of the arm and progressed through 70 percent of the arm cross section before final separation. The fatigue crack initiation area was approximately in line with the inboard end of the pilot tube that is assembled into the hub arm bore with an interference fit. During operation of the propeller, a slight stress increase is expected to occur at the position corresponding to the assembled inboard end of the pilot tube, and this may have caused the fatigue origin area to be located at this radial position.

The inside diameter surface of the separated hub arm contained scratch marks that extended over about one-half of the hole wall circumference and from the fracture surface to a position slightly inboard of the plane of the fracture. The fatigue origin area was located within this area of scratches.

Examination of the three remaining intact arms after removal of the pilot tubes disclosed evidence of scratch marks similar to those found on the separated arm.

As the propeller rotates, the predominant load experienced by the hub arm is from the centrifugal loads on the propeller blades. These loads result in radial_tension throughout the hub arm. In addition, drag and thrust loads on the blades produce bending in the hub arms. During normal operation (in forward propeller thrust), these bending loads result in maximum tension in the aft leading-edge quadrant of the hub arm. During reverse thrust, the maximum tension would be in the forward leading-edge quadrant of the hub arm. However, the fatigue origin area was not located in either of these quadrants, but was, instead, found in the forward trailing-edge quadrant of the hub arm, suggesting that the circumferential location of the fatigue initiation region was not influenced by bending loads but may have been determined by local stress raisers such as the scratches on the inside diameter surface of the separated hub arm.

The separated propeller hub was manufactured in 1977 and was overhauled in 1983 and 1988. Records from the first overhaul are not available. The records from the second overhaul indicate that two of the four pilot tubes had been replaced at that time. Because similar scratches were found on all four hub arms, it is unlikely that the scratches were introduced during the more recent overhaul. Also, the scratches extended inboard of the position contacted by the pilot tubes, and it is unlikely that removal or insertion of the tubes could create such damage. However, the scratches could have been created by some manufacturing or repair process any time that the pilot tubes were not present in the hub arms. The Safety Board believes it more likely that scratches were produced during original manufacturing of the hub.

General corrosion damage and corrosion pitting were also noted on various portions of the inside diameter surface of the remaining portion of the separated hub arm, including the area from which the fatigue cracking initiated. The general corrosion damage had partially obliterated the scratches from the inside diameter surface. Scanning electron microscopic examination of the fracture revealed no evidence of corrosion pits at the individual fatigue initiation sites, indicating that corrosion may not have substantially contributed to initiation of the fatigue cracking.

The Safety Board believes that it is more likely that the fatigue cracking on the separated hub initiated from the scratches than from corrosion damage. Regardless of the cause of initiation, the failure of a hub arm on a HC-B4 propeller hub could result in a catastrophic accident.

The separated hub, model HC-B4TN-5DL, had accumulated a total of 4,432 hours of operation since new. Information provided by Hartzell indicated that the highest time model HC-B4 propeller hub (manufactured since the 1960s) has accumulated about 15,000 hours of operation. The Safety Board believes that all HC-B4 Hartzell propeller hubs that have accumulated at least 3,000 hours should be subjected to a one-time inspection for cracks.

Hartzell recommends that the HC-B4 propeller be overhauled every 5 years or 3,000 hours, whichever comes first. Performing the hub inspection at the next recommended overhaul could allow passage of too much time before the inspection is performed. Therefore, the Safety Board believes that the hubs should be inspected the next time that the propeller assembly is overhauled, or at the next annual inspection (or equivalent), whichever occurs first. If the inspection of these hubs reveals additional hubs with cracks, then periodic inspections of the HC-B4 hubs may also be necessary.

The interference fit between the pilot tube and the hub arm increases the possibility that removal and reassembly of the pilot tubes (to do a direct inspection of the inside diameter surfaces of the hub arms) could damage the hole wall. However, the Safety Board believes that hub arm cracks could be detected without removal of the pilot tubes through the use of an inspection method such as ultrasonic inspection.

The design of the HC-B4 hub and the manufacturing processes used to make it are very similar to the design and processes used to make the Hartzell three-bladed hub (basic model HC-B3) and the Hartzell five-bladed hub (HC-B5). Hartzell has made more than 27,000 three-bladed hubs and more than 1,300 five-bladed hubs. Because of the similarities between the types of hubs, the Safety Board is concerned that hubs of the three- and five-bladed design could also be susceptible to cracking because they could have damage similar to the scratch marks and corrosion found on the separated four-bladed hub. A failure of a hub arm on a three- or five-bladed hub could also result in a catastrophic accident, and the Safety Board believes that inspections of these hubs may also be necessary to determine if they have a cracking problem.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Develop, with the assistance of Hartzell Propeller, Incorporated, a nondestructive inspection technique capable of detecting hub arm cracks stemming from the inside diameter surface of the hub arm at the approximate location of the inserted end of the pilot tubes on Hartzell model HC-B4 propeller hubs, and issue an airworthiness directive requiring that HC-B4 hubs with 3,000 hours or more be inspected using this technique the next time the propeller assembly is overhauled for any reason, or at the next annual inspection (or equivalent), whichever is first. (Class II, Priority Action) (A-92-81)
>
> Determine, based on the results of the inspections requested in Safety Recommendation A-92-81, if the hub arms on Hartzell model HC-B4 propeller hubs with 3,000 hours or more should be inspected at periodic intervals. If such inspections are warranted, issue an airworthiness directive, as appropriate, requiring periodic inspections. (Class II, Priority Action) (A-92-82)

Determine if Hartzell model HC-B3 and -B5 propeller hubs, based on similarity of design and fabrication processes with the HC-B4 propeller hub, should be inspected for cracking in the hub arms. If such inspections are warranted, issue an airworthiness directive, as appropriate, requiring periodic inspections. (Class II, Priority Action) (A-92-83)

Chairman VOGT, Vice Chairman COUGHLIN, and Members LAUBER, HART, and HAMMERSCHMIDT concurred in these recommendations.

By: Carl W. Vogt
Chairman

U.S. Department
of Transportation

Federal Aviation
Administration

Memorandum

Subject: ACTION: NTSB Safety Recommendations
A-92-81 through -83

Date: AUG 14 1992

From: Director of Accident Investigation, AAI-1

Reply to
Attn of:

To: Manager, Aircraft Certification Directorate, ANE-100

The attached safety recommendations were adopted by the National Transportation Safety Board (NTSB) and issued to the Federal Aviation Administration (FAA) on August 13, 1992. We are required to respond formally to the NTSB within 90 days with the FAA's plan to address the issues discussed in each recommendation. The requirement for the formal response and the statutory suspense of 90 days are established by the Independent Safety Board Act of 1974 and FAA Order 1220.2B, issued February 16, 1990. Order 1220.2B designates the Office of Accident Investigation (AAI) as the FAA focal point for ensuring compliance and effective implementation of the NTSB safety recommendation program.

AAI assigns action responsibility for recommendations directly to the region/office(s) having subject responsibility. Based on our review, action responsibility for Safety Recommendations A-92-81 through -83 are assigned to your office for response.

In your evaluation of the subject recommendation(s), please review paragraph 7 of Order 1220.2E for information on the response and a proposed timetable for the completion of actions. The overall response should first consider the nature of the safety issue as well as the feasibility of implementing the recommendation, possible alternative actions, and any other appropriate measures that the FAA should consider. If you have questions about the appropriateness of assignment of action responsibility for this/these safety recommendation(s) to your region/office or the drafting of the recommendation response, please notify AAI-200 (267-9629) as soon as possible. Since the final response to the NTSB must be coordinated within Headquarters, your initial evaluation and plan of action should reach AAI-200 by September 21, 1992. This will allow time for clarification and coordination of a formal response and ensure that the 90-day suspense is met.

We appreciate your support in this program and your efforts to resolve the safety issues as quickly and completaly as possible.

William R. Hendricks

Attachment(s)

HARTZELL PROPELLER INC.
One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.

HARTZELL

Facsimile Transmittal

1992

Destination
TEU | Chicago Aircraft | 165C

Company: FAA	**Address:** 2300 E. Devon, Des Plaines Il.	**Date:** SEP 10, 1992
Attention: Tim Smyth		**FAX Number:** 312-694-7834
Sender: Richard L. Edinger		**Page** 1 **of** 1

Subject: NTSB Recommendation for MU-2B-60 & similar props.

We have been studying the NTSB recommendation concerning the MU-2 hub failure. We believe there is currently no justification, especially considering the economic impact, for their recommendation to inspect all 3, 4, and 5 blade propellers having similar design features to the failed MU-2B-60 hub.

As we discussed today, the issuance of a Service Bulletin aimed at the MU-2B-60 aircraft, and perhaps other similar MU-2B aircraft as well, may make more sense.

At the present time, we believe the Service Bulletin would require an inspection at overhaul. It may be that a one-time inspection to check for cracks and for proper pilot tube interference would be all that is needed.

We would like to discuss this further in your visit tomorrow.

SEP 15 1992

INFORMATION: Interim Reply to AAI-200
Memorandum on Safety Recommendations
A-92-81 through -83

Manager, Engine and Propeller Directorate
Aircraft Certification Service, ANE-100

Manager, Recommendation and Quality Assurance Division, AAI-200

This refers to your August 14, 1992, memorandum regarding safety recommendations for Hartzell HC-B4TN-5CL propeller and if applicable HC-B3 and -B5 propeller hubs.

We are reviewing the recommendations and plan to have a formal response by October 30, 1992.

ORIGINAL SIGNED BY
JACK A. SAIN

Jack A. Sain

cc: ACE-140C

FILE No: 8110-4, Hartzell M&D

ACTION: Response To NTSB Safety Recommendation A-92-81 through -83.

TO: Mr. Martin Buckman, ANE-110

FROM; ACE-140C

The National Transportation Safety Board has recommended that the FAA develop a nondestructive inspection technique for detecting cracks in the pilot tube bore on Hartzell HC-B4 steel hub design model propellers. In addition, inspect these steel hub designs and determine if these inspections warrant the issuance of an Airworthiness Directive (AD) requiring periodic inspections. The NTSB also requested the FAA consider expanding this inspection to Hartzell HC-B3 (3 way) and HC-B5 (5 way) propeller models.

The FAA has reviewed this request with Hartzell propeller and a review of the service difficulty history on Hartzell steel hub designs was accomplished. To date, the failure described in the NTSB recommendation is the only known failure of a Hartzell steel hub design. The cause of the failure has not been determined although corrosion and minor machine marks were found in the adjacent areas near the failure location. The FAA and Hartzell independently reviewed their own service difficulty records to determine if cracks have been found during magnetic particle inspections of these hubs during overhaul. No reports of cracks in the area of concern had been found.

The NTSB recommendation indicates that over 28,000 HC-B3 and HC-B5 steel hub propellers are in service. These propeller designs have accumulated millions of safe flight hours. The Hartzell HC-B4 design has also accumulated a significant service history with one reported failure of a steel hub arm.

Hartzell propeller has conducted an extensive analysis on the HC-B4 hub design to try to determine the cause for the failure on this propeller hub design as installed on the Mitsubishi MU-2B-60 airplane. A finite element modeling of this area has been accomplished and the FAA was briefed by Hartzell propeller that the stress levels in this areas are acceptable even with varying degrees of interference fit between the pilot bore and the pilot tube. No metallurgical discrepancies were found in the hub material.

Hartzell propeller is continuing their investigation and will provide to the FAA their final recommendation by the end of November 1992.

NTSB-81

The NTSB recommends that all steel hub propellers be inspected at the 3,000 hour service interval or at the next annual inspection whichever occurs first. Hartzell procedures already require a magnetic particle inspection on steel hub designs when the propeller is overhauled. The manufacturers recommended interval is 3,000 hours time-in-service per Hartzell Service Letter 61R.

Based on this and the excellent service history of this design the FAA does not feel that an AD is appropriate to address this issue. The FAA will continue to monitor the service history of these hub designs.

This is an interim response, the FAA's final response will be made once Hartzell propeller finalizes it's investigation.

This office would like to commend the NTSB for the excellent presentation of the data developed for this recommendation. The data presented will help the FAA assess the manufacturers position on this issue.

The FAA will provide it's final position on this recommendation in 60 days.

Tim Smyth.

U.S. Department
of Transportation
Federal Aviation
Administration

Memorandum

Subject ACTION: Request for Reply to AAI-1 Memorandum on Safety Recommendation A-92-81 through -83

Date NOV 0 9 1992

From Manager, Engine and Propeller Directorate, Aircraft Certification Service, ANE-100

Reply to Attn of

To Manager, Recommendation and Quality Assurance Division, AAI-200

This is in response to the August 14, 1992, AAI-1 memorandum forwarded to this office. The memorandum concerned safety recommendations for the Hartzell HC-B4TN-5DL propeller and if applicable the HC-B3 and -B5 propeller hubs. You additionally referred to our September 15, 1992, interim memorandum to your office.

The National Transportation Safety Board (NTSB) has recommended that the Federal Aviation Administration (FAA) develop a nondestructive inspection technique for detecting cracks in the pilot tube bore on the Hartzell HC-B4 steel hub design model propellers. In addition, inspect these steel hub designs and determine if these inspections warrant the issuance of an Airworthiness Directive (AD) requiring periodic inspections. The NTSB also requested the FAA consider expanding this inspection to Hartzell HC-B3 (3 way) and HC-B5 (5 way) propeller models.

The FAA has reviewed these recommendations with Hartzell Propeller and a review of the service difficulty history on Hartzell steel hub designs was accomplished. To date, the one failure described in the NTSB recommendation is the only known failure of a Hartzell steel hub design. The cause of the failure has not been determined although corrosion and minor machine marks were found in the adjacent areas near the failure location. The FAA and Hartzell independently reviewed their own service difficulty records to determine if cracks have been found during magnetic particle inspections of these hubs during overhaul. No reports of cracks in the area of concern had been found.

The NTSB recommendation indicates that over 28,000 HC-B3 and HC-B5 steel hub propellers are in service. These propeller designs have accumulated millions of safe flight hours. The Hartzell HC-B4 design has also accumulated a significant service history with one reported failure of a steel hub arm.

Hartzell propeller has conducted an extensive analysis on the HC-B4 hub design to try to determine the cause for the failure on this propeller hub design as installed on the Mitsubishi MU-2B-60 airplane. A finite element modeling of this area has been accomplished and the FAA was briefed by Hartzell Propeller that the stress levels in this areas are acceptable even with varying degrees of interference fit between the pilot bore and the pilot tube. No metallurgical discrepancies were found in the hub material.

Hartzell Propeller is continuing their investigation and will provide the FAA with their final recommendation during December 1992.

The NTSB recommends that all steel hub propellers be inspected at the 3,000 hour service interval or at the next annual inspection whichever occurs first. Hartzell procedures already require a magnetic particle inspection on steel hub designs when the propeller is overhauled. The manufacturers recommended interval is 3,000 hours time-in-service per Hartzell Service Letter 61R.

Based on this and the service history of this design the FAA does not feel that an AD is appropriate at this time. However, the FAA will continue to monitor the service history of these hub designs.

This is considered an interim response, our final response will be made when Hartzell propeller completes it's investigation.

This office would like to commend the NTSB for the excellent presentation of the data developed for this recommendation. The data presented will help assess the manufacturers position on this issue.

A final answer on the recommendations will be provided within 90 days.

Jack A. Sain

US Department
of Transportation
Federal Aviation
Administration

Office of the Administrator

800 Independence Ave. S.W.
Washington, D.C. 20591

JAN 4 1993

The Honorable Carl W. Vogt
Chairman, National Transportation
Safety Board
490 L'Enfant Plaza East, SW.
Washington, DC 20594

Dear Mr. Chairman:

This is in further response to Safety Recommendations A-92-81 through -83 issued by the Board on August 13, 1992, and supplements our letter dated October 26, 1992. These safety recommendations were issued as a result of the Board's investigation of an accident on September 27, 1991, involving a Mitsubishi MU-2B-60, Canadian registry C-FFSS, which was on a cargo flight. The airplane sustained substantial damage when a propeller blade separated in flight near Utica, New York. The airplane was climbing through flight level 190 when the pilot felt a strong vibration, followed shortly by a loud "bang." The vibration increased and became so severe that the pilot experienced considerable difficulty controlling the airplane. Despite this difficulty, the airplane landed at Utica Airport. There were no injuries.

A-92-81. Develop, with the assistance of Hartzell Propeller, Incorporated, a nondestructive inspection technique capable of detecting hub arm cracks stemming from the inside diameter surface of the hub arm at the approximate location of the inserted end of the pilot tubes on Hartzell model HC-B4 propeller hubs, and issue an airworthiness directive requiring that HC-B4 hubs with 3,000 hours or more be inspected using this technique the next time the propeller assembly is overhauled for any reason, or at the next annual inspection (or equivalent), whichever is first.

A-92-82. Determine, based on the results of the inspections requested in Safety Recommendation A-92-81, if the hub arms on Hartzell model HC-B4 propeller hubs with 3,000 hours or more should be inspected at periodic intervals. If such inspections are warranted, issue an airworthiness directive, as appropriate, requiring periodic inspections.

A-92-83. Determine if Hartzell model HC-B3 and -B5 propeller hubs, based on similarity of design and fabrication processes with the HC-B4 propeller hub, should be inspected for cracking in the hub arms. If such inspections are warranted, issue an airworthiness directive, as appropriate, requiring periodic inspections.

FAA Comment. The Federal Aviation Administration (FAA) agrees with the intent of these safety recommendations but does not believe that airworthiness directive action is required. The FAA completed its review of the service history of the Hartzell Propeller steel hub designs. To date, the one failure described by the Safety Board is the only known failure of a Hartzell steel hub design. The FAA and Hartzell Propeller have independently reviewed their own service difficulty records to determine if cracks in the hub had been found during magnetic particle inspections. No reports of cracks in this area had been found.

The Safety Board indicates that over 28,000 HC-B3 and HC-B5 steel hub propellers are in service. These propeller designs have accumulated millions of safe flight hours. The Hartzell HC-B4 design has also accumulated a significant service history with one reported failure of the steel hub arm. Hartzell Propeller has conducted an extensive analysis on the HC-B4 hub design as installed on the Mitsubishi MU-2B-60 to try to determine the cause of the failure. A finite element modeling of this area has been accomplished and Hartzell Propeller has indicated to the FAA that stress levels in this area are acceptable even with varying degrees of interference fit between the pilot bore and the pilot tube. No metallurgical discrepancies were found in the hub material. Hartzell Propeller is continuing its investigation and will provide the FAA with its findings.

The Safety Board recommends that all steel hub propellers be inspected at the 3,000-hour service interval or at the next annual inspection, whichever occurs first. Hartzell Propeller procedures already require a magnetic particle inspection on steel hub designs when the propeller is overhauled. The manufacturer's recommended interval is 3,000 hours time-in-service per Hartzell Service Letter 61R. Based on the service history and the fact that current procedures require inspection at 3,000-hour service intervals, the FAA does not believe that an airworthiness directive is necessary at this time. The FAA will continue to monitor the service history of these hub designs.

I will keep the Board apprised of the FAA's progress on these safety recommendations.

Sincerely,

Thomas C. Richards
Administrator

National Transportation Safety Board
Washington, D.C. 20594

Office of the Chairman

January 6, 1993

JAN 7 2 11 PM
RECEIVED

A930107025
XRA920813C17

Honorable Thomas C. Richards
Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Richards:

Thank you for your letter dated October 26, 1992, responding to Safety Recommendations A-92-81 through -83. These recommendations resulted from the Board's investigation of an accident involving a Mitsubishi MU-2B-60 airplane that sustained damage when one of the four Hartzell propeller blades on the right engine separated in flight near Utica, New York, on September 27, 1991.

The Safety Board found that loss of the propeller blade was the result of fatigue cracking that initiated from the inside diameter surface of one of the arms of the HC-B4 Hartzell propeller hub. Safety Recommendation A-92-81 asked the FAA to develop, with Hartzell's assistance, an inspection method capable of detecting hub arm cracks and to issue an airworthiness directive (AD) requiring that HC-B4 hubs with over 3,000 hours be inspected. Safety Recommendation A-92-82 asked the FAA to mandate repeated inspections of the affected hubs, if so warranted by the results of the initial inspections. Safety Recommendation A-92-83 asked the FAA to determine if other similarly designed Hartzell propeller hubs should also be inspected for cracking.

The Safety Board notes that the FAA is reviewing the service history of the Hartzell propeller hubs to determine the magnitude of the problem. Regardless of whether the service history of the HC-B4 hubs contains other examples of cracking or fractures similar to the Utica accident, the Safety Board believes that a once-through-the-fleet inspection of the subject hubs is necessary, as requested in Safety Recommendation A-92-81. Because your letter does not indicate that the FAA has taken any steps toward this action, the Board has classified Safety Recommendation A-92-81 "Open--Unacceptable Response." Also, because implementation of Safety Recommendation A-92-82 must be preceded by a once-through-the-fleet inspection of the HC-B4 hubs, this recommendation is also classified "Open--Unacceptable Response."

The Safety Board believes that a review of the design and fabrication process similarities between the HC-B4 and other Hartzell propeller hub models is necessary, as requested in Safety Recommendation A-92-83, to determine if other Hartzell propeller hub models should also be inspected. Because your letter does not adequately address this issue, the Board has classified Safety Recommendation A-92-83 "Open--Unacceptable Response."

The Safety Board urges the FAA to reconsider the actions planned in response to Safety Recommendations A-92-81 through -83.

Sincerely,

Carl W. Vogt
Chairman

cc: Mr. Donald R. Trilling
Director
Office of Transportation Regulatory Affairs

From: Royace Prather/Tim Smyth, ACE-140C

Date unsure
Late Oct - Early Nov 1992

ACTION: Response To NTSB Safety Recommendation A-92-81 through -83.

TO: Mr. Jay Pardee, ANE-101/Mr. Martin Buckman, ANE-110

FROM: ACE-140C

The National Transportation Safety Board recommanded that the FAA develop a nondestructive inspection technique for detecting cracks in the pilot tube bore on Hartzell HC-B4 steel hub design model propellers. In addition, inspect these steel hub designs and determine if these inspections warrant the issuance of an Airworthiness Directive (AD) requiring periodic inspections. The NTSB also requested the FAA consider expanding this inspection to Hartzell HC-B3 (3 way) and HC-B5 (5 way) propeller models.

The FAA has reviewed this request with Hartzell propeller and a review of the service difficulty history on Hartzell steel hub designs was accomplished. To date, the failure described in the NTSB recommandation is the only known failure of a Hartzell steel hub design. There are over 35,000 steel propeller hub configurations in service that have had a satisfactory service history with no recorded failures of this type prior to the Utica incident.

This failure was felt to be an isolated incident. During normal operation (Forward Thrust), bending loads result in maximum tension in the aft leading edge quadrant of the hub arm. During reverse thrust, the maximum tension would be in the forward leading quadrant. However, the fatigue initiation was not located in either of these quadrants, but was, instead, found in the forward trailing edge quadrant of the hub arm.

The FAA and Hartzell Propeller investigated the NTSB's request to develop an inspection procedure that could be accomplished on the propeller hub without removing the propeller from the aircraft. This was determined not to be practical. It was also determined that the only reliable method to inspect the areas in question could only be accomplished by disassembling the propeller. A cost analysis was conducted to determine the impact of this type of inspection on the flying public. The manufacturer and the FAA concluded that it would cost over 15,000,000 dollars to accomplish this one-time inspection. Given the unique and isolated failure and the excellent service history of these hubs, the FAA determined that this request was not justified at the FAA initial response to the NTSB.

The cause of the failure has not been determined although corrosion and minor machine marks were found in the adjacent areas near the failure location. The FAA and Hartzell independently reviewed their own service difficulty records to determine if cracks have been found during magnetic particle/Non Destructive Inspections (NDI)/visual inspections of these hubs during overhaul/maintenance.

No reports of cracks in the area of concern had been found.

The NTSB recommendation indicated that over 28,000 HC-B3 and HC-B5 steel hub propellers are in service. These propeller designs have accumulated millions of safe flight hours. The Hartzell HC-B4 design has also accumulated a significant service history with one reported failure of a steel hub arm (Until The Latest Failure, Dubuque).

Hartzell Propeller has conducted an extensive analysis on the HC-B4 hub design to try to determine the cause for the failure on this propeller hub design as installed on the Mitsubishi MU-2B-60 airplane. A finite element modeling of this area has been accomplished and the FAA was briefed by Hartzell propeller that the stress levels in this areas are acceptable even with varying degrees of interference fit between the pilot bore and the pilot tube. No metallurgical discrepancies were found in the hub material.

The NTSB recommends that all steel hub propellers be inspected at the 3,000 hour service interval or at the next annual inspection whichever occurs first. Hartzell procedures already require a magnetic particle/NDI inspection on steel hub designs when the propeller is overhauled. The manufacturers recommended interval is 3,000 hours time-in-service per Hartzell Service Letter 61R.

Based on this and the excellent service history of this design the FAA did not feel that an AD was appropriate to address this issue. The FAA continued to monitor the service history of these hub designs.

Hartzell Propeller was/is continuing their investigation and will provide their final recommendations to the FAA. The FAA was finalizing the additional data that was collected as a result of the NTSB's response back to us in January, 1993.

This was an interim response, the FAA's final response will be made once Hartzell Propeller and the FAA finalizes it's investigation. We are now in the process of finalizing the necessary data to issue a telegraphic AD.

For further information, please contact Mr. Tim Smyth at (312) 694-7130.

Royce Prather
ACE-140C

U.S. Department
of Transportation

Federal Aviation
Administration

Memorandum

Subject: ACTION: NTSB Safety Recommendations
A-92-81 through -83

Date: JAN 26 1993

From: Manager, Recommendation and Quality
Assurance Division, AAI-200

Reply to
Attn. of:

To: Manager, Engine and Propeller Directorate, ANE-100

Attached for your information is a copy of an NTSB letter dated January 6, 1993, indicating the following official action by the Board:

A-92-81 - Open Unacceptable Response
A-92-82 - Open Unacceptable Response
A-92-83 - Open Unacceptable Response

This letter crossed in the mail with the FAA's letter dated January 4, 1993. The Board is responding to FAA's letter dated October 26, 1992, and the classification reflects this.

You indicated in your last status report that you would respond again by February 26, 1993. As a result, we are showing February 26, 1993, as a due date in our tracking records. Please provide this office with a status by that date.

Frank Del Gandio

Attachment

A930 [illegible]
XRA921221019

National Transportation Safety Board

Washington, D.C. 20594

Office of the Chairman

March 4, 1993

MAR 8 9 57 AM '93
RECEIVED

Mr. Joseph M. Del Balzo
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Del Balzo:

Thank you for the Federal Aviation Administration (FAA) letter dated January 4, 1993, further responding to Safety Recommendations A-92-81 through -83. These recommendations resulted from the National Transportation Safety Board's investigation of an accident involving a Mitsubishi MU-2B-60 airplane that sustained damage when one of the four blades of the Hartzell HC-B4 propeller on the right engine separated from the propeller while in flight near Utica, New York, on September 27, 1991.

The Safety Board determined that the propeller blade separated from the propeller because of fatigue cracking that initiated from the inside diameter surface of one of the arms of the propeller hub. Safety Recommendation A-92-81 asked the FAA to develop, with Hartzell's assistance, an inspection method capable of detecting hub arm cracks and to issue an airworthiness directive (AD) requiring that HC-B4 hubs with over 3,000 hours be inspected. Safety Recommendation A-92-82 asked the FAA to mandate repeated inspections of the affected hubs, if so warranted by the results of the initial inspections. Safety Recommendation A-92-83 asked the FAA to determine if other similarly designed Hartzell propeller hubs should also be inspected for cracking.

Your letter indicates that propeller hubs used on the Hartzell HC-B3, HC-B4, and HC-B5 propellers have accumulated a large amount of service time with only one reported failure of a hub arm. Hartzell procedures recommend a magnetic particle inspection each time the hub is overhauled (every 3,000 hours). Your letter indicates that an airworthiness directive is not necessary, based on the service history and the presence of the magnetic particle inspection in the overhaul procedures.

The area from which the cracking initiated on the propeller hub from the Utica, New York, incident was the inside diameter surface of the hub arm, at a location approximately corresponding to the end of the pilot tube. This area contained scratches that were probably introduced during the original manufacturing of the hub, and it is possible that other hubs have similar scratches that could cause crack initiation. A representative of Hartzell indicated to the Safety Board that magnetic particle inspections of the hubs in question are normally performed without removal of the pilot tubes from the hub arms. Because the pilot tubes are assembled to the hub with an interference fit, disassembly of a tube is difficult and can damage the surface of the hub arm hole. Therefore, a pilot tube would be removed during overhaul only if it was damaged or worn.

Without the removal of the pilot tube, a crack that initiates at the inside diameter of the hub arm will not be detectable by magnetic particle inspection until it penetrates or nearly penetrates the outer surface of the hub arm. The Safety Board believes that a crack of this size would propagate to failure in much less than 3,000 hours of operation. Therefore, magnetic particle inspection performed during overhaul with the pilot tubes in place is an inappropriate method for detecting cracks of this type. The Safety Board still believes that an appropriate inspection method, such as ultrasonic inspection, needs to be developed and applied to the hubs of the HC-B4 propeller.

Separation of a blade from a Hartzell HC-B4 propeller on another airplane could result in a catastrophic accident. The Safety Board notes that the FAA is continuing to monitor and is awaiting the outcome of Hartzell's continuing investigation. However, the Board is concerned that the FAA has not taken action in the interim to examine the possibility of using a more appropriate method to inspect the hub arms. Further, the Board is concerned that the FAA sees no need to review the design and fabrication process of other Hartzell propeller hub models to determine if similarities in design might indicate the need for inspection of these other hub models. Because of these concerns and because the Safety Board does not believe that the FAA has addressed these recommendations in sufficient detail, we have classified Safety Recommendations A-92-81, -82, and -83 as "Open--Unacceptable Response."

The Board looks forward to receiving a report on the findings from the Hartzell continuing investigation and a report on the FAA's own analysis of the situation as the monitoring continues. While the Hartzell investigation progresses, the Board encourages the FAA to develop an inspection method that could efficiently detect the type of flaw that caused this accident without removal of the pilot tubes from the hub arms.

Sincerely,

Carl W. Vogt
Chairman

cc: Mr. Donald R. Trilling
Director
Office of Transportation Regulatory Affairs

Draft Response NTSB Safety Recommendations A-92-81 throught -83.

TO: Mr. Martin Buckman, ANE-110

FROM: Tim Smyth, ACE-140C

Dear Marty:

We have reviewed the National Transportation Safety Boards letter dated January 6, 1993 and offer the following for your consideration:

Safety Recommendations A-92-81 and A-92-83:

The FAA has initiated a further operational service review of Hartzell "steel hub" design propellers, (e.g. HC-B3, HC-B4 and HC-B5 models) to determine if the incident that occurred with a Mitsubishi MU-2B-60 airplane with Hartzell HC-B4 requires a fleet wide, one-time inspection of all HC-B4 model propellers. The FAA is considering a one-time inspection program for all Hartzell "steel hub" propeller designs based on the results of this operational service review and this one incident. The inspection interval is yet to be determined.

Safety Recommendation A-92-82:

The FAA does not have any field service difficulty data to support a repetitive inspection program for these propellers. The 3,000 hour interval cited by the NTSB corresponds to the manufacturers Category II recommended overhaul interval of 3000 hours time-in-service or 60 calendar months, whichever occurs first, except for agricultural aircraft which is limited to 36 calender months.

This criteria is defined in Hartzell Service Letter 61R, dated February 28, 1992. A significant percentage of these propellers are installed on aircraft operated under FAR, Part 135 and are overhauled in accordance with the 3,000 hour or 60 calendar month criteria. The inspection data generated as a result of these regular inspections has not shown any defects found that prematurely retire these "steel hub" designs. There has been a few isolated cases of cracks found during overhaul but not in the location found as described in the MU-2B-60 incident.

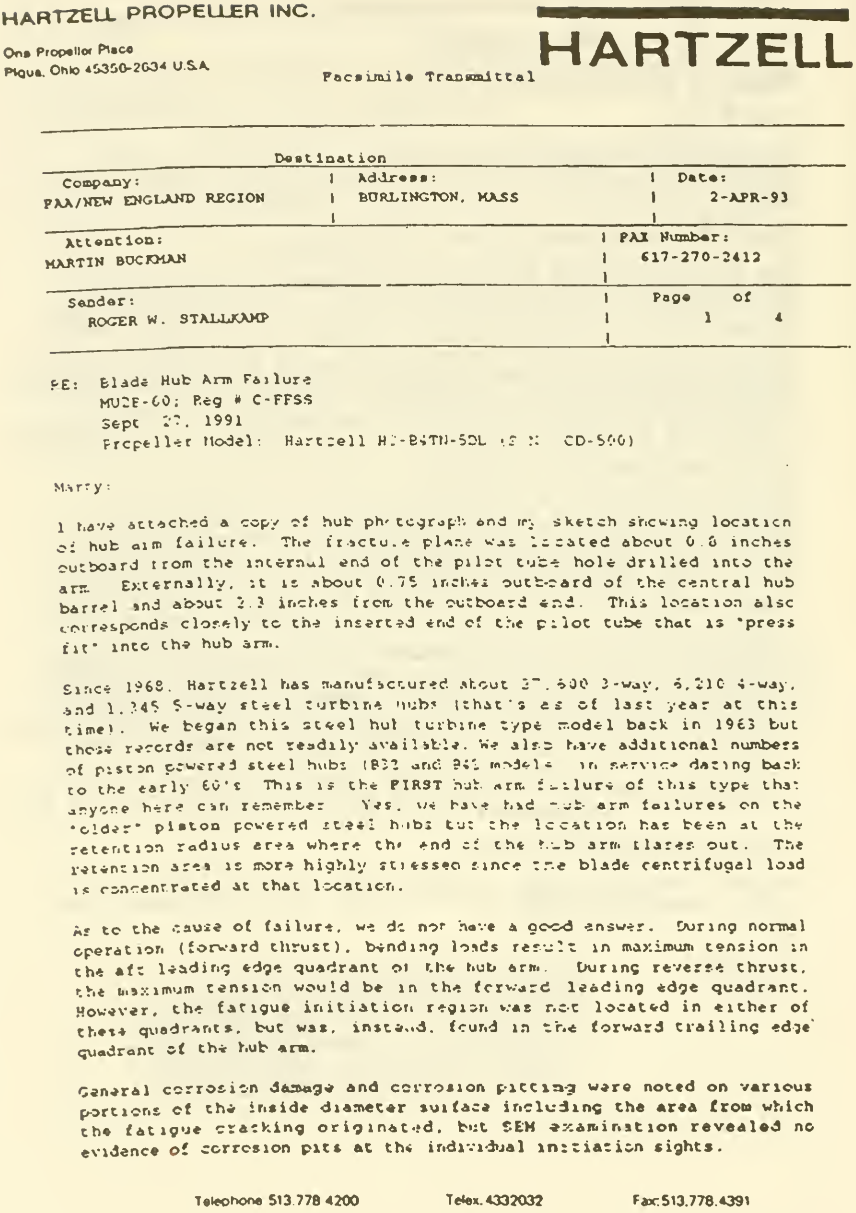
Safety Recommendation A-92-83

The FAA answer to Safety Recommendation A-92-81 addresses the NTSB's issue.

Tim Smyth
ACE-140C

Post-it™ brand fax transmittal memo 7671 # of pages ▸ 1

To Marty Buckman	From Tim Smyth
Co. ANE-110	Co. ACE-140C
Dept.	Phone # (312) 694-7130
Fax # (617) 270-2412	Fax # (312) 694-7834



HARTZELL PROPELLER INC.
One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.

HARTZELL

Facsimile Transmittal

Destination

Company:	Address:	Date:
FAA/NEW ENGLAND REGION	BURLINGTON, MASS	2-APR-93

Attention:	FAX Number:
MARTIN BUCKMAN	617-270-2412

Sender:	Page of
ROGER W. STALLKAMP	1 4

RE: Blade Hub Arm Failure
MU2B-60; Reg # C-FFSS
Sept 27, 1991
Propeller Model: Hartzell HC-B4TN-5DL (S/N CD-560)

Marty:

I have attached a copy of hub photograph and my sketch showing location of hub arm failure. The fracture plane was located about 0.8 inches outboard from the internal end of the pilot tube hole drilled into the arm. Externally, it is about 0.75 inches outboard of the central hub barrel and about 2.3 inches from the outboard end. This location also corresponds closely to the inserted end of the pilot tube that is "press fit" into the hub arm.

Since 1968, Hartzell has manufactured about 37,500 3-way, 6,210 4-way, and 1,345 5-way steel turbine hubs (that's as of last year at this time). We began this steel hub turbine type model back in 1963 but those records are not readily available. We also have additional numbers of piston powered steel hubs (832 and 941 models) in service dating back to the early 60's. This is the FIRST hub arm failure of this type that anyone here can remember. Yes, we have had hub arm failures on the "older" piston powered steel hubs but the location has been at the retention radius area where the end of the hub arm flares out. The retention area is more highly stressed since the blade centrifugal load is concentrated at that location.

As to the cause of failure, we do not have a good answer. During normal operation (forward thrust), bending loads result in maximum tension in the aft leading edge quadrant of the hub arm. During reverse thrust, the maximum tension would be in the forward leading edge quadrant. However, the fatigue initiation region was not located in either of these quadrants, but was, instead, found in the forward trailing edge quadrant of the hub arm.

General corrosion damage and corrosion pitting were noted on various portions of the inside diameter surface including the area from which the fatigue cracking originated, but SEM examination revealed no evidence of corrosion pits at the individual initiation sights.

Marty Buckman
Page Two

The inside diameter of the surface of the separated hub arm contained slight scratch marks that extended over about one-half of the hole wall circumference and from the fracture surface to a position slightly inboard of the plane of the fracture. The fatigue origin area was located within this area of scratches. Similar scratch marks were found on the three remaining hub arm hole wall surfaces.

Given the above, the NTSB concluded that the (slight) scratch marks were the most likely (and only thing left) cause of the failure and that it failed in this particular radial area due to the slight stress increase caused by the inboard end of the pilot tube.

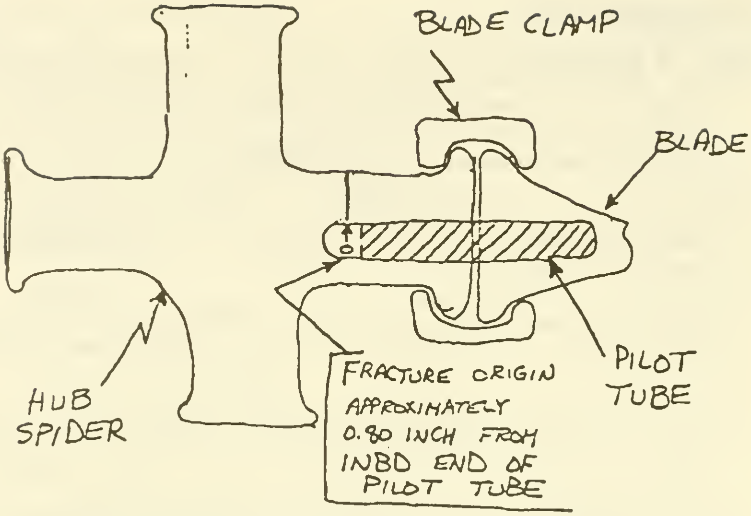
While we can not dispute the above, other possibilities, such as on oversize pilot tube (two pilot tubes were replaced at the last overhaul and the accident tube was not recovered) could have been a factor in the crack initiation.

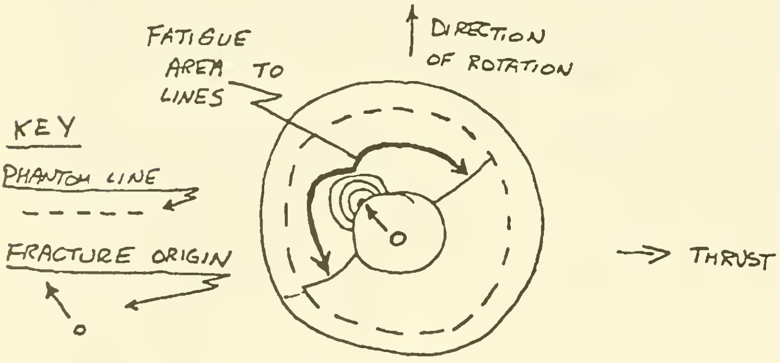
The NTSB would like a one-time inspection of all hubs, however, we have not found a way to edequately check for hub arm cracks by any external methods. The only reliable method is to remove the propeller, pull the pilot tubes, and do an internal examination. Since the pilot tubes are press fit into the hub, their removal would scrap out every tube. The cost in pilot tubes alone would amount to about $15,000,000.00! Given this unique failure and the excellent service history of these hubs, I would find that cost, and that's far from the total cost, hard to justify.

Regards,

Roger W.

cc: Dick Edinger


BLADE CLAMP
BLADE
HUB SPIDER
FRACTURE ORIGIN APPROXIMATELY 0.80 INCH FROM INBD END OF PILOT TUBE
PILOT TUBE



LOOKING INBD TOWARD CENTER OF HUB

TO FAA
April 12, 93

Marty:

I have looked through the hub material you have provided me and have the following comments and observations.

Recommend a better drawing be provided of the hub.

The magnetic particle inspection of the outer surface is useless for any interior initiated cracking.

If corrosion and scratches are critical defects on the interior surface past the internal pilot tube end, then a visual borescope inspection is recommended. The 3/8" diameter access can be managed by a number of commercially available borescopes. This would require removal of the blade clamp and blade for access to the open end of the pilot tube.

If cracking on the interior surface past the internal pilot tube end is considered critical, then an interior eddy current inspection is viable. A special offset eddy current probe would be required to perform the inspection and these are easily available commercially. This would require removal of the blade clamp for access to the open end of the pilot tube.

I do not recommend an eddy current technique from the outside surface looking for cracking, corrosion, or surface scratches anywhere on the interior.

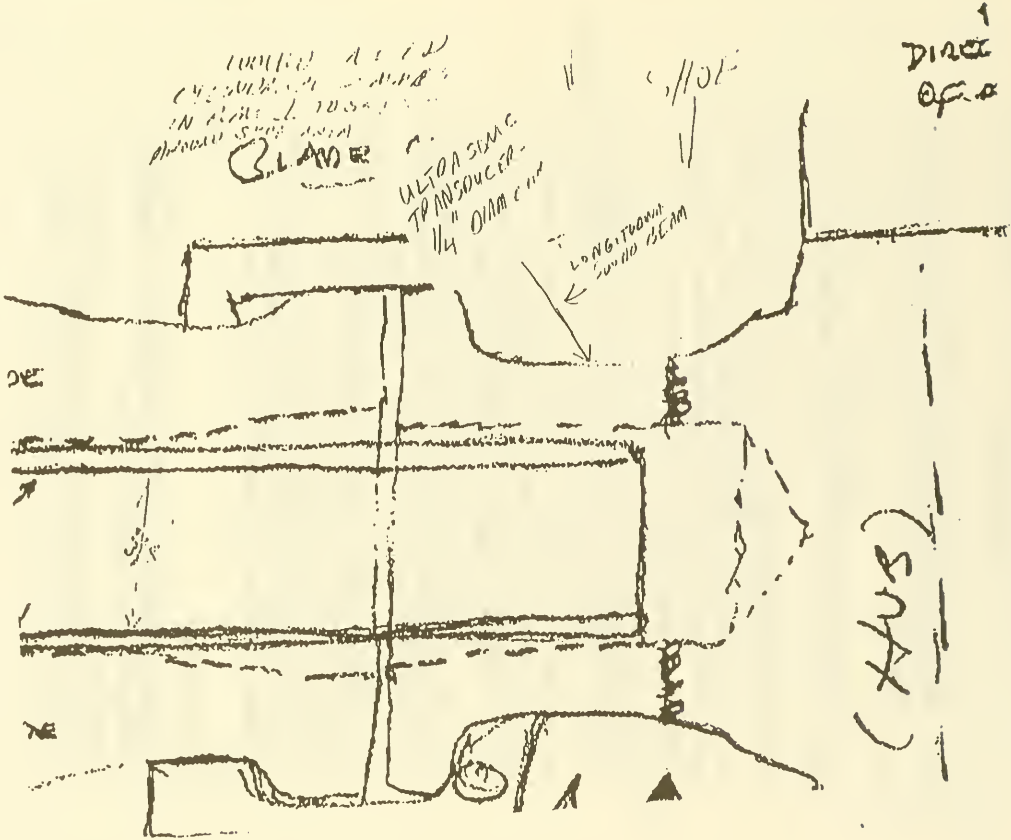
The easiest ultrasonic inspection procedure for the hub interior would be to do a full immersion technique. I can't recommend this for other reasons such as a requirement to remove from service and the possible hazard from corrosion.

Level 1 or 2
ultrasonic
Level 3 for setup
for Procedure ?

It may be possible to do an ultrasonic inspection from the exterior looking for cracks in the vicinity of the end of the internal pilot tube on the interior of the hub. An accurate drawing of the hub in the area indicated on the attached is necessary to more adequately evaluate the possible procedure. Cylindrical symmetry in the plane indicated would also be required. The procedure would use a transducer mounted in a special shoe at an appropriate angle to detect reflections from the side of a surface initiated crack. It would require removal of the blade clamp.

Alfred L. Broz

Alfred L. Broz


CLAMP
ULTRASONIC TRANSDUCER 1/4" DIAM
LONGITUDINAL SOUND BEAM
(SNAX)
DIREC
OF

BRIEFING PAPER

Subject: Mitsubishi MU-2 Accident

Current Information:

- Crack discovered inside of [illegible] the hub ARM that retains the blade.

- Hub was manufactured in 1979.

- Over 27,000 hubs OF SIMILAR DESIGNS manufactured by Hartzell in the last 30 years. These are installed on several models of airplanes.

- PRELIMINARY INFO INDICATES THAT The fatigue crack ORIGIN is in the same area of the hub as the accident on the Canadian airplane a year ago, but, PRELIMINARY INFO INDICATES THAT not at the same location.

- The fatigue crack ORIGINS in both accidents are in one of the lowest stressed areas of the hub ARM which is not the expected site for fatigue cracking to ~~occur~~ ORIGINATE. This could point to accidental repair or installation damage.

- This part of the hub is not, to the best of our knowledge at this time, inspected during the 3000 hour overhaul as some have said. We will confirm that information.

- To inspect internally, the press fit tube end of the blade would have to be removed. This has a high potential for causing damage to the hub.

- Hartzell had previously advised us that they do not believe the hub can be inspected on the airplane.

Actions Underway:

- Aircraft Certification (AIR) has an engineer on ~~sight~~ SITE to obtain the latest engineering facts.
- ENGR WORK
- Hartzell has been advised of the high priority the FAA has placed on developing an interim inspection technique

and are themselves giving the matter the highest of priorities.

- Dr. Al Broz, an FAA world renowned specialist in non-destructive inspection techniques, has been working with AIR engineers in Boston for several weeks to develop an on-wing inspection technique.

- This action is a result of our continued assessment of the previous accident.

- We have contacted the NTSB this morning to suggest that we combine forces with them to develop, also with Hartzell, an appropriate on-wing inspection technique.

- AIR engineers and managers have been aggressively responding to the recent information on the propeller blade through most of the night last night.

- The AIR personnel will be present during the tear down of the propeller hub at the NTSB, along with Hartzell engineers. We expect this to occur no earlier than this Saturday.

- ~~AIR propeller experts, along with Dr. Broz, have been working for the last few weeks on a possible airworthiness directive for inspection of the hub. The pacing item has been the development of a reliable NDI technique.~~

- Sufficient AIR resources are being diverted from other efforts to make things happen as soon as physically possible.

- FAA has contacted the NTSB to cooperate in any followon actions the Board may recommend.

Timing:

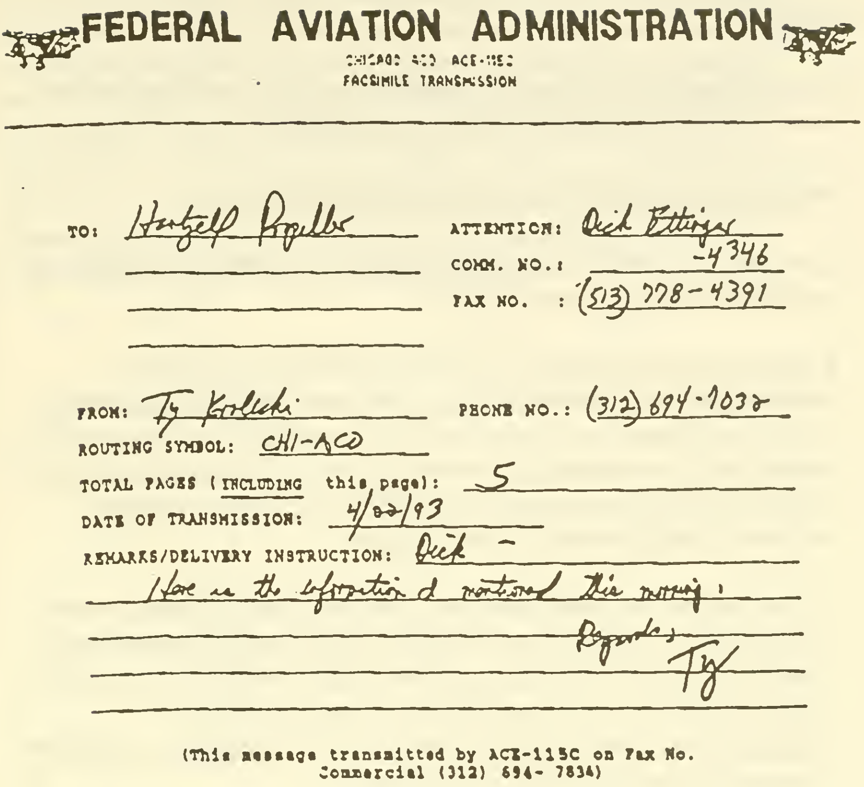
- We expect to witness the tear down of the hub on FRIDAY/ Saturday.

~~[illegible]~~

-
-

- We expect to be able to develop an on-wing inspection within a few days and will then have to field test it which could take another couple of days.

- If information continues to point for the need for an airworthiness directive to mandate an inspection we could be prepared to issue it early next week.



FEDERAL AVIATION ADMINISTRATION
CHICAGO ACO ACE-115C
FACSIMILE TRANSMISSION

TO: Hartzell Propeller
ATTENTION: Dick Ettinger
COMM. NO.: -4346
FAX NO. : (513) 778-4391

FROM: Ty Kroleski
PHONE NO.: (312) 694-7032
ROUTING SYMBOL: CHI-ACO
TOTAL PAGES (INCLUDING this page): 5
DATE OF TRANSMISSION: 4/02/93
REMARKS/DELIVERY INSTRUCTION: Dick –
Here is the information I mentioned this morning:
Regards,
Ty

(This message transmitted by ACE-115C on Fax No.
Commercial (312) 694- 7834)

Marty:

I have looked through the hub material you have provided me and have the following comments and observations.

Recommend a better drawing be provided of the hub.

The magnetic particle inspection of the outer surface is useless for any interior initiated cracking.

If corrosion and scratches are critical defects on the interior surface past the internal pilot tube end, then a visual borescope inspection is recommended. The 3/8" diameter access can be managed by a number of commercially available borescopes. This would require removal of the blade clamp and blade for access to the open end of the pilot tube.

If cracking on the interior surface past the internal pilot tube end is considered critical, then an interior eddy current inspection is viable. A special offset eddy current probe would be required to perform the inspection and these are easily available commercially. This would require removal of the blade clamp for access to the open end of the pilot tube.

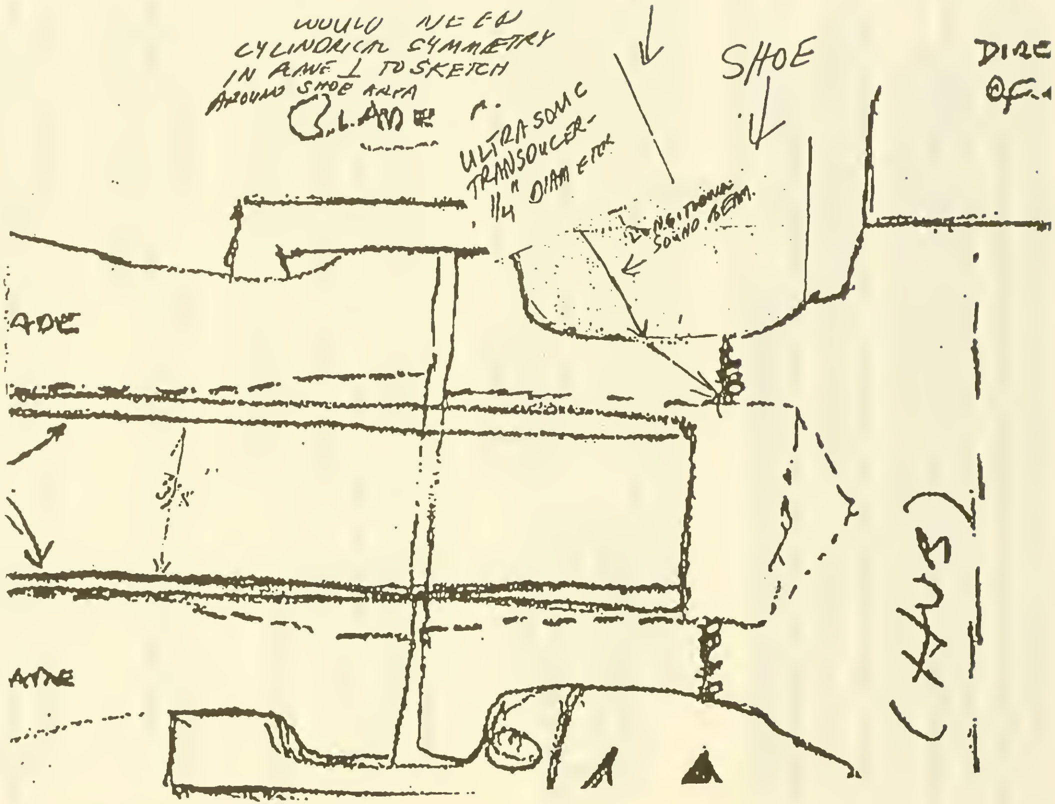
I do not recommend an eddy current technique from the outside surface looking for cracking, corrosion, or surface scratches anywhere on the interior.

The easiest ultrasonic inspection procedure for the hub interior would be to do a full immersion technique. I can't recommend this for other reasons such as a requirement to remove from service and the possible hazard from corrosion.

Level 1 or 2,
ultrasonic
Level 3 for setup
& Procedure

It may be possible to do an ultrasonic inspection from the exterior looking for cracks in the vicinity of the end of the internal pilot tube on the interior of the hub. An accurate drawing of the hub in the area indicated on the attached is necessary to more adequately evaluate the possible procedure. Cylindrical symmetry in the plane indicated would also be required. The procedure would use a transducer mounted in a special shoe at an appropriate angle to detect reflections from the side of a surface initiated crack. It would require removal of the blade clamp.

Alfred L. Broz


WOULD NEED
CYLINDRICAL SYMMETRY
IN PLANE ⊥ TO SKETCH
AROUND SHOE AREA
SHOE
DIRE
OF
ULTRASONIC
TRANSDUCER-
1/4" DIAMETER
LONGITUDINAL
SOUND BEAM.
ADE
ANE
3½"
(SHAFT)

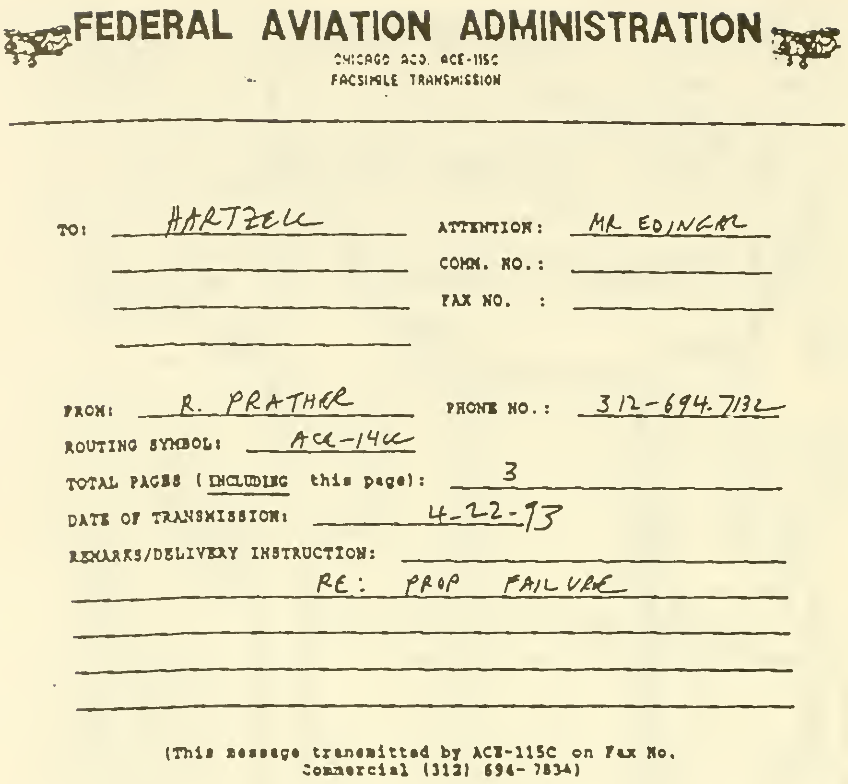
TELL HARTZELFO

1) DO BORE SCOPE -

2) EVALUATE BEST OF ET

UT

= USE BEST



FEDERAL AVIATION ADMINISTRATION

CHICAGO ACO. ACE-115C
FACSIMILE TRANSMISSION

TO: HARTZELL
ATTENTION: MR EDINGER
COMM. NO.:
FAX NO. :

FROM: R. PRATHER
PHONE NO.: 312-694-7132
ROUTING SYMBOL: ACE-140C
TOTAL PAGES (INCLUDING this page): 3
DATE OF TRANSMISSION: 4-22-93
REMARKS/DELIVERY INSTRUCTION:
RE: PROP FAILURE

(This message transmitted by ACE-115C on Fax No.
Commercial (312) 694-7834)

Questions from Tom McSweeny regarding Hartzell prop involved in fatal accident(Governor of S. D.)

Tim — (1) Need to know the reason for the 3000 hour magnetic particle inspection (MPI) called out in Hartzell's manuals. (Why 3000 hours? Why MPI?)

Hartzell (2) How many repair stations are there that can do prop repair?

Hartzell (3) Need listing of all applications for this hub (and similar hubs).

Hartzell (4) Are there any manufacturing similarities between this hub and the one involved in the Utica incident? (Did they come from the same production lot or have close serial numbers, or anything else along those lines?)

(5) Is there any historical similarity between the two hubs? (Have similar repairs been done, similar blade replacements, or the same repair station been involved?)

NOTE: I passed the above questions on to Dick Ettinger at Hartzell around 10:30 A.M. today. 4/21/93.

Later requests from ANE(Jay Pardee, Jim Jones, Marty B. and Al Broz).

Hartzell — (1) They want copies of typical manuals (or sections of manuals) that cover the inspection requirements for that hub. Include any drawings, pictures, brochures, or sketches that may help tell the story. USE FAX OR OVERNIGHT MAIL ✓

Completed — (2) Comments passed on from Tony Broderick and Tom McSweeney: Alert Hartzell that if the NTSB recommends grounding of props with > X hours or cycles, we'll probably have to accept it. It is a rough political climate with new Sec'y and new Administrator. HTZ should try to have a viable inspection technique read

Completed — (3) ANE Al Broz wants to talk directly to the Htz player working on the inspection.

Completed — (4) Marty B. asked if his 4/12 fax (with Al Broz info) was passed on to HTZ. I told him I didn't know if you had faxed it earlier but that I had faxed it this morning.

Questions From Tom McSweeny regarding Hartzell Propeller Involved In MU2B-60 Accident, Dubuque, Iowa.

(1) Need to know the reason for the 3000 hour magnetic particle inspection (MPI) called out in Hartzell's service manuals. Why 3,000 hours time-in-service? Why MPI?

There is no special reason for the magnetic particle inspection requirement. Hartzell Propeller considers this inspection process along with other visual and Non Destructive Inspection techniques to be good maintenance/inspection practices to help insure continued airworthiness. The 3,000 hour time-in-service interval for inspection/overhaul is Hartzell Propeller's recommended interval based on operational service wear, blade erosion, corrosion considerations and seal deterioration.

(2) How many repair stations are there that can do prop repair?

There are approximately 100 U.S. Repair facilities and 44 foreign Repair facilities.

(3) Need listing of all applications for this propeller hub (and similar hubs).

Hartzell Propeller has faxed a 20 page matrix on all applicable aircraft models to both the Engine and Propeller Directorate and the Chicago ACO.

(4) Are their any manufacturing similarities between this hub and the one involved in the Utica incident? (Did they come from the same production lot or have close serial numbers, or anything else along those lines?)

The propeller hubs were produced two years apart. The Utica Propeller in 1977 and the Dubuque propeller in 1979. Hartzell Propeller is developing additional details on the manufacturing aspects of these two hubs. The data will be made available as we get it.

(5) Is there any historical similarity between the two hubs? (Have similar repairs been done, similar blade replacements, of the same repair station been involved?)

The similarity at this time appears to be that these hubs have failed on the same type airplane model using the same engines and are both have approximately the same total time. Utica incident approximately 4400 hours total time and the Dubuque accident 4300 hours. The calendar time since new is similar, approximately 14 years. We are trying to collect additional data on these hubs. We will provide more data as we get it.

(6) They want copies of typical manuals (or sections of manuals) that cover the inspection requirements for that hub. Include drawings, pictures, brochures, or sketches that may help tell the story. (USE FAX OR OVERNIGHT MAIL)

Hartzell has sent a complete data package to the Engine and Propeller Directorate on 4-22-93.

(7) Comments passed on from Tony Broderick and Tom McSweeny: Alert Hartzell that if NTSB recommends grounding of props with >X hours or cycles, we'll probably have to accept it. Try to get Hartzell to develop a viable inspection technique.

We have discussed these options with Hartzell Propeller and they understand the situation. They are working diligently to develop an inspection/rework procedure. Hartzell has stated that the only aircraft that may need to be grounded is the MU2B-60. Approximately 117 aircraft are affected. We are working on a draft telegraphic AD to implement the final actions to address the safety issues.

(8) Al Bros, ANE-MRS wants to talk directly to the Hartzell personnel working on the inspection.

Completed 4-22-93.

(9) How does these propellers Total Time compare to fleet leaders.

These are considered average time propellers. More detailed data will be made available as we get it.

(10) Will a complete survey of the Hub bore be made?

Yes, Hartzell has committed to this. (4-22-93)

(11) Can we justify limiting possible AD action to just the MU2B-60.

We will review all possible service data and make our recommendations shortly.

Royace Prather
ACE-140C,
4-22-93

SOME SPECULATIVE RECOMMENDATIONS AND COMMENTS CONCERNING: HUB FAILURES ON MITSUBISHI MU-2B-60

1. Recommend clarifying the discrepancy between data provided by telephone from Hartzell on April 22, 1993 concerning stress levels due to interference fit of the pilot tube to the hub and information provided Jim Wildey on April 23, 1992 (10,000 psi/0.001" interference and 1,500 psi/0.001").

2. Recommend revisiting the calculations provided Jim Wildey on April 23, 1992 for the case of the 0.04" under minimum mentioned in Hartzell Quality Control Report HP91-017.

3. Recommend clarifying the assembly and mating of the pilot tube to the hub. This includes the dimensional tolerances for the mated items and the quality assurance techniques and procedures utilized for the dimensional tolerances.

4. Recommend determining if localized hand grinding is acceptable for dimensional tolerances on the mating pieces and the quality assurance procedures and techniques to assure dimensional tolerances as a result of hand grinding.

5. If the failure initiating cause is high stress levels generated by the interference mating of the hub to the pilot tube I know of no way to nondestructively determine those stress levels reliably or to determine the small dimensional mismatch of the mating pieces. That is: If the failure was caused by the interference fit of the pilot tube to the hub, there is no inspection solution to the issue.

Alfred L. Broz.

Alfred L. Broz

4/23/93 (Appx)

HARTZELL PROPELLER INC.

One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.

HARTZELL

APR 27, 1993

Mr. Donald P. Michal
Chicago Aircraft Certification Office
Department of Transportation
Federal Aviation Administration
2300 East Devon Avenue
Des Plaines, Illinois 60018

SUBJECT: MU-2B-60 Service Bulletin
REFERENCE: HC-B4TN-5()L/LT10282B-5.3R

Gentlemen:

We are enclosing the requested Service Bulletin No. A182, applicable to the MU-2B-60 aircraft. We have followed your guidelines in constructing this Service Bulletin so as to address this aircraft in the most expeditious manner.

We must emphasize that so far, a cause for the fracture is unknown. Information gained from this Service Bulletin, combined with the results of Hartzell, FAA and NTSB investigations, should allow a more accurate and appropriate response in the future.

We have applied a 600 hour reinspection interval for this inspection. We believe this reinspection interval to be quite conservative but acceptable for the initial issuance of this action.

Please note also that we have not discovered a method of NDT inspecting the propeller on-wing.

Yours truly,

Richard L. Edinger
Vice President, Engineering

HARTZELL PROPELLER INC.
One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.
Telephone: 513.778.4200
Telex: 4332032
Fax: 513.778.4391

HARTZELL

ALERT SERVICE BULLETIN

Revision 4:20PM

SERVICE BULLETIN A182 FAA APPROVED April 28, 1993
CODE: B

SUBJECT:

Mandatory Inspection Requirement for Hub Pilot Tube Bores

EFFECTIVITY:

HC-B4TN-5(D,G,J)L/LT10282(N)(B,K)-5.3R* propellers installed on Mitsubishi model MU-2B-60 aircraft

- The parentheses indicate the presence or absence of additional letter(s) which vary the basic propeller hub and propeller blade model designation. This Bulletin still applies regardless of whether these letters are present or absent on the propeller hub and blade model designation.

NOTE: The condition described in this Bulletin is NOT the same as the blade internal bearing bore inspection called for in Service Bulletin 170B and Federal Aviation Administration (FAA) Airworthiness Directive AD 93-01-09.

DISCUSSION:

There have been two propeller hub arm separations involving MU-2B-60 aircraft. Therefore, effective immediately:

1. Four blade propeller hubs currently installed on, or to be installed on, Mitsubishi MU-2B-60 aircraft must be repetitively inspected in accordance with this Bulletin.
2. Four blade propeller hubs removed from MU-2B-60 aircraft may not be installed on any other aircraft unless an Initial Inspection is performed in accordance with this Bulletin.

Inspection requires disassembly of the propeller and inspection of the internal pilot tube bores of the hub. This inspection is to be performed only at the Hartzell Propeller Service Center.

(continued)

COMPLIANCE:

MU-2B-60 propeller installations must be repetitively inspected after their initial inspection. The basis for inspection is total time in service of the propeller hub.

NOTE: A previous overhaul DOES NOT constitute compliance with this Service Bulletin.

Initial Inspection:

If total time since new (TSN) is equal to or greater than 3000 hours of operation, or if total time is unknown, compliance is required: within 10 hours of operation or by June 30, 1993, whichever occurs first.

If total time since new (TSN) is less than 3000 hours of operation, compliance is required: upon reaching 3010 hours, or within 200 hours of operation, or by May 1, 1994, whichever occurs first.

Any incident of blade strike (blades bent beyond repair limits) after the effective date of this Bulletin requires compliance prior to further flight. If there has been any history of previous blade strike (blades bent beyond repair limits) compliance is required within 10 hours of operation or by June 30, 1993, whichever occurs first.

Repetitive Inspection:

After initial inspection is completed, propeller hubs are to be repetitively inspected thereafter at intervals not to exceed 600 hours of operation or 60 calendar months, whichever occurs first.

REQUIRED ACTION:

1. Remove propeller per airframe manufacturer's maintenance manual.
2. Disassemble propeller in accordance with Hartzell Service Manual 118F (or subsequent revision). Disassembly to remove blades from the hub must be performed by an approved propeller repair station.
3. Ship hub unit, P/N 840-139 or 840-91, to the Hartzell Service Center for inspection.

   NOTE: The 840-139 Hub Unit consists of: one (1) D3405-2 Hub Unit with four (4) A1891A Pilot Tubes and four (4) HP-1125-A81 Expansion Plugs.
   The 840-91 Hub Unit consists of: one (1) D3405-1 Hub Unit with four (4) A1891A Pilot Tubes and four (4) HP-1125-A81 Expansion Plugs.
4. **Hartzell will perform pilot tube removal, visual and magnetic particle inspection in accordance with Hartzell Service Instruction 195 "Instruction for Inspection of MU-2B-60/840-139/840-91 Hub Units". Hartzell will install new pilot tubes, and reship the hub unit to the propeller repair station. Hubs already in operational service which pass inspection will be identified at end of the hub serial number**

HARTZELL PROPELLER INC.

One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.

HARTZELL

Facsimile Transmittal

Destination

Company: FAA	Address: 2300 E. Devon, Des Plaines	Date: 28-APR-93
Attention: Tim Smyth		FAX Number: 312-694-7834
Sender: Dick Edinger		Page 1 of

Subject: MU-2B-60 Vibration Approval

Tim, attached are the relevant vibration approval documents for the MU-2B-60 propeller.

Secondly, we have completed our 'quick-look' at the relative 1-P moments for the MU-2B-60 aircraft and others which are considered to be among the upper end of the population. We have shown that the MU-2B-60 is the highest of the 1-P moment spectrum of aircraft (using this propeller type) for cruise (high cycle) operation. Please note, even this 1-P moment value does not create a high fatigue stress condition for the hub pilot tube bore.

cc: Ben
Gil

8110-3 Hartzell TC #P40EA

NOV 8 1977

Vibration Approval: Propeller Model HC-B4TN-5()L/LT10282-5.3R
on AiResearch Engine Model TPE-331-10 in Mitsubishi Models MU-2B-40
and MU-2B-60 Aircraft
Chief, Propulsion Section, AGL-214

AGL-214

Confirming our telephone advice of November 4, 1977, the subject installations are approved vibratorily in 9[illegible] to 97 inches propeller diameter with specified engines flat rated to 665 SHP and 715 SHP.

The following restriction is required:

> "Continuous ground operation prohibited between 1145 and 795 r.p.m. (72 to 50% of engine r.p.m.)."

This note is the same as in previous approvals on MU-2B-25A, -26A, -35A, and -36A aircraft.

Original signed by
Gary L. Killion

GARY L. KILLION

cc: AGL-214:Weiss
Hartzell Propeller, Inc.
Attn: R.V. Grimes, President
AGL-214:Walker:em:11/7/77:309

Hartzell PROPELLER. INC.

AREA CODE 513
TELEPHONE [illegible]
TELEX [illegible]

Manufacturers of Airplane Propellers
330 WASHINGTON AVE.
PIQUA, OHIO 45356

October 27, 1977

Department of Transportation
Federal Aviation Administration
Great Lakes Region
2300 East Devon Avenue
Des Plaines, IL 60018

Attention: Mr. Keith Anderson
AGL - 210

Reference: Vibration Approval of HC-B4TN-5( )L/LT10282-5.3R on AiResearch Engine Model TPE-331-10 on the Mitsubishi Aircraft Models MU-2B-40/-60.

Subject: FAA Form 8110-3, dated October 27, 1977.

Gentlemen:

Enclosed herewith please find a copy of the subject data for vibration approval of the above referenced installation. Please advise us of your concurrence with the above.

Yours truly,

HARTZELL PROPELLER, INC.

R. V. Grimes
President

RVG/kaf

Enclosure: 1

cc: Mr. W. B. Harlamert
Mr. Gilbert D. Howe

HARTZELL PROPELLER INC.

One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.

HARTZELL

FAXED 4/30/93

Facsimile Transmittal

Destination

Company: FAA	**Address:** 2300 E. Devon, Des Plaines	**Date:** 30-APR-93
Attention: Tim Smyth		**FAX Number:** 312-694-7834
Sender: Dick Edinger		Page 1 of 1

In response to your request, we have made a study of certain other aircraft to see how blade shank bending moment compares to the MU-2B-60. Aircraft were selected by hub model similarity to the MU-2B-60 aircraft. Aircraft studied are:

Mitsubishi MU-2B-40, Beech 300B, Beech F90, Beech 1900C,
Dornier 228-200, CASA C212

We have examined a single flight condition (maximum cruise) to try to judge how the MU-2B-60 aircraft aligns with the rest of the fleet. This simple analysis ignores the host of flight conditions which apply to the aircraft and is therefore inadequate to rank these aircraft

Fatigue testing has not identified the fracture location as the probable initiation site. Consequently, our past data collection methods have not concentrated on this location. Therefore a Finite Element Analysis or other technique is required to make the projection to the failure site.

We have compared the projected operational vibratory loads at the fracture site to vibratory loads tested in the laboratory. We conclude that the projected vibratory loads are well below those necessary to produce a fatigue failure.

The bottom line is this:

Laboratory fatigue data and Finite Element Analysis do not explain the fracture. The evidence available to us indicates that the aircraft we have studied operate in a safe stress field.

Until the fundamental cause of the fatigue fractures on two MU-2B-60 aircraft is determined, focusing on the load value in the hub arm will not guarantee a solution.

HARTZELL PROPELLER INC.
One Propeller Place
Piqua, Ohio 45356-2634 U.S.A.
Telephone: 513.778.4200
Telex: 4332032
Fax: 513.778.4391

HARTZELL
ALERT SERVICE BULLETIN

SERVICE BULLETIN A182 FAA APPROVED April 28, 1993
CODE: B

SUBJECT:

Mandatory Inspection Requirement for Hub Pilot Tube Bores

EFFECTIVITY:

HC-B4TN-5(D,G,J)L/LT10282(N)(B,K)-5.3R* propellers installed on Mitsubishi model MU-2B-60 aircraft

* The parentheses indicate the presence or absence of additional letter(s) which vary the basic propeller hub and propeller blade model designation. This Bulletin still applies regardless of whether these letters are present or absent on the propeller hub and blade model designation.

NOTE: The condition described in this Bulletin is NOT the same as the blade internal bearing bore inspection called for in Service Bulletin 170B and Federal Aviation Administration (FAA) Airworthiness Directive AD 93-01-09.

DISCUSSION:

There have been two propeller hub arm separations involving MU-2B-60 aircraft. Therefore, effective immediately:

1. Four blade propeller hubs currently installed on, or to be installed on, Mitsubishi MU-2B-60 aircraft must be repetitively inspected in accordance with this Bulletin.
2. Four blade propeller hubs removed from MU-2B-60 aircraft may not be installed on any other aircraft unless an Initial Inspection is performed in accordance with this Bulletin.

Inspection requires disassembly of the propeller and inspection of the internal pilot tube bores of the hub. This inspection is to be performed only at the Hartzell Propeller Service Center.

(continued)

COMPLIANCE:

MU-2B-60 propeller installations must be repetitively inspected after their initial inspection. The basis for inspection is total time in service of the propeller hub.

NOTE: A previous overhaul DOES NOT constitute compliance with this Service Bulletin.

Initial Inspection:

If total time since new (TSN) is equal to or greater than 3000 hours of operation, or if total time is unknown, compliance is required: within 10 hours of operation or by June 30, 1993, whichever occurs first.

If total time since new (TSN) is less than 3000 hours of operation, compliance is required: upon reaching 3010 hours, or within 200 hours of operation, or by May 1, 1994, whichever occurs first.

Any incident of blade strike (blades bent beyond repair limits) after the effective date of this Bulletin requires compliance prior to further flight. If there has been any history of previous blade strike (blades bent beyond repair limits) compliance is required within 10 hours of operation or by June 30, 1993, whichever occurs first.

Recetitive Inscection:

After initial inspection is completed, propeller hubs are to be repetitively inspected thereafter at intervals not to exceed 600 hours of operation or 60 calendar months, whichever occurs first.

REQUIRED ACTION:

1. Remove propeller per airframe manufacturer's maintenance manual.
2. Disassemble propeller in accordance with Hartzell Service Manual 118F (or subsequent revision). Disassembly to remove blades from the hub must be performed by an approved propeller repair station.
3. Ship hub unit, P/N 840-139 or 840-91, to the Hartzell Service Center for inspection.

   NOTE: The 840-139 Hub Unit consists of: one (1) D3405-2 Hub Unit with four (4) A1891A Pilot Tubes and four (4) HP-1125-A81 Expansion Plugs.
   The 840-91 Hub Unit consists of: one (1) D3405-1 Hub Unit with four (4) A1891A Pilot Tubes and four (4) HP-1125-A81 Expansion Plugs.
4. Hartzell will perform pilot tube removal, visual and magnetic particle inspection in accordance with Hartzell Service Instruction 195 "Instruction for Inspection of MU-2B-60/840-139/840-91 Hub Units". Hartzell will install new pilot tubes, and reship the hub unit to the propeller repair station. Hubs already in operational service which pass inspection will be identified at end of the hub serial number

with suffix letter "M" followed by a number (1, 2, 3...) to indicate the number of repetitive inspections. New production hubs which pass inspection will be identified at the end of the serial number with suffix letter "M".

5. Reassemble propeller per Manual 118F (or subsequent revision).
6. Install propeller per airframe manufacturer's maintenance manual.
7. Make logbook entry indicating compliance with this Bulletin.

APPROVAL:

This Bulletin has been coordinated with, and approved by, the manager of the FAA Chicago Aircraft Certification Office.

FAA approval has been obtained on technical data in this publication that affects propeller type design.

TO: Office of Aviation System Standards
Oklahoma City, Oklahoma
ATTN: Manager, Engineering and Manufacturing Branch,
AVN-110

Emergency distribution by priority letter is required.

Send to all U.S. owners and operators of Mitsubishi MU-2B-60 Model Aircraft with Hartzell HC-B4TN-5(D,G,J)L Model Propellers Installed.

This priority letter Airworthiness Directive (AD) is prompted by two reports of propeller hub arm assembly fatigue failures and subsequent propeller blade separations from aircraft in flight. Preliminary data indicates that fatigue cracks can originate in the propeller hub arm assembly. This condition, if not corrected, can result in fatigue cracks in propeller hub arm assemblies progressing to failure, resulting in departure of the hub arm and blade, and may result in engine separation and subsequent loss of aircraft control.

The Federal Aviation Administration (FAA) has reviewed and approved the technical contents of Hartzell Alert Service Bulletin (ASB) No. A182, dated April 28, 1993, that describes procedures for removal from service, inspection, rework, and replacement of propeller hub assemblies.

Since an unsafe condition has been identified that is likely to exist or develop on other propellers of this same type design, this AD requires removal from service of propeller hub assemblies and replacement with serviceable propeller hub assemblies. This priority letter AD is an interim action until more data is available on the cause of propeller hub arm assembly failures.

Pursuant to the authority of the Federal Aviation Act of 1958, delegated to me by the Administrator, the following priority letter AD 93-09-04, applicable to Hartzell Model HC-B4TN-5(D,G,J)L propellers installed on Mitsubishi Model MU-2B-60 aircraft is issued and is effective immediately upon receipt.

93-09-04 Hartzell Propeller Inc.: Docket No. 93-ANE-25.

Applicability: Hartzell Propeller Inc. HC-B4TN-5(D,G,J)L/LT10282(B,K)-5.3R and HC-B4TN-5(D,G,J)L/LT10282N(B,K)-5.3R Propellers installed on Mitsubishi Model MU-2B-60 Aircraft.

NOTE: The parentheses indicate the presence or absence of an additional letter(s) which vary the basic propeller hub and blade model designation. This Airworthiness Directive (AD) still applies regardless of whether these letters are present or absent on the propeller hub and blade model designation.

Compliance: Required as indicated, unless accomplished previously.

To prevent fatigue cracks in propeller hub arm assemblies progressing to failure, resulting in departure of the hub arm and blade, and that may result in engine separation and subsequent loss of aircraft control, accomplish the following in accordance with the compliance schedule as indicated:

TIME-SINCE-NEW (TSN) IN HOURS ON THE EFFECTIVE DATE OF THIS AD OR PROPELLER HUB ASSEMBLIES THAT HAVE EXPERIENCED A BLADE STRIKE	COMPLIANCE REQUIRED
TSN greater than or equal to 3000 hours or TSN unknown.	Within the next 10 hours time in service (TIS) or two calendar months after the effective date of this AD, whichever occurs first, and thereafter at intervals not to exceed 600 hours TIS or 60 calendar months since last inspection, whichever occurs first.
TSN less than 3000 hours.	Prior to the accumulation of 3010 hours TSN, or within the next 200 hours TIS or 12 months after the effective date of this AD, whichever occurs first, and thereafter at intervals not to exceed 600 hours TIS or 60 calendar months since last inspection, whichever occurs first.

Regardless of TSN, propeller hub assemblies that have experienced a blade strike prior to the effective date of this AD. See paragraph (c) of this AD for the definition of a blade strike	Within the next 10 hours TIS or two calendar months after the effective date of this AD, whichever occurs first and thereafter at intervals not to exceed 600 hours TIS or 60 calendar months since last inspection, whichever occurs first.
Regardless of TSN, propeller hub assemblies that experience a blade strike after the effective date of this AD. See paragraph (c) of this AD for the definition of a blade strike.	Prior to further flight, and thereafter at intervals not to exceed 600 hours TIS or 60 calendar months since last inspection, whichever occurs first.

(a) Remove affected propeller hub assemblies from the aircraft and return to Hartzell Propeller Inc., One Propeller Place, Piqua, OH 45356-2634 U.S.A. for inspection and specified rework procedures, in accordance with Hartzell Alert Service Bulletin (ASB) No. A182, dated April 28, 1993. Propeller hubs removed from Mitsubishi Model MU-2B-60 aircraft may not be installed on any other aircraft unless an inspection is performed in accordance with Hartzell ASB No. A182, dated April 28, 1993.

(b) Reinstall affected propeller hub assemblies that have had the hub arm bores inspected and reworked as necessary, pilot tubes replaced, and marked at the end of the hub serial number with suffix letter "M", followed by a number (1,2,3, etc.) to indicate the number of repetitive inspections performed in accordance with Hartzell ASB No. A182, dated April 28, 1993; or install new production hubs which have passed the inspection and have been marked at the end of the hub serial number with the suffix letter "M".

(c) A blade strike is defined as a propeller having any blade(s) that has been bent beyond repair limits in accordance with Hartzell Service Letter 61R, dated February 28, 1992.

(d) The "calendar month" compliance time stated in this AD allow the performance of the required action prior to the last day of the month in which compliance is required.

NOTE: For example, if action is required 2 calendar months from April 28, 1993, the required actions are to be performed not later than June 30, 1993.

(e) An alternate method of compliance or adjustment of the compliance time that provides an acceptable level of safety may be used if approved by the Manager, Chicago Aircraft Certification Office. The request should be forwarded through an appropriate FAA Maintenance Inspector, who may add comments and then sent it to the Manager, Chicago Aircraft Certification Office.

NOTE 1: Information concerning the existence of approved alternative methods of compliance with this Airworthiness Directive, if any, may be obtained from Chicago Aircraft Certification Office.

NOTE 2: Although Hartzell Propeller is presently the only FAA-approved repair facility authorized to conduct the requirements of this AD, other facilities may be authorized through the alternative method of compliance procedure in paragraph (e) of this AD.

(f) Except when propeller hub assemblies experience a blade strike after the effective date of this AD, special flight permits may be issued in accordance with FAR 21.197 and 21.199 to operate the airplane to a location where the requirements of this AD can be accomplished.

(g) Copies of the applicable service information may be obtained from Hartzell Propeller Inc., One Propeller Place, Piqua, OH 45356-2634. This information may be examined at the FAA, New England Region, Office of the Assistant Chief Counsel, 12 New England Executive Park, Burlington, MA.

(h) Priority Letter AD 93-09-04, issued April 28, 1993, becomes effective upon receipt.

For further information contact: Tim Smyth, Aerospace Engineer, Chicago Aircraft Certification Office, FAA, Small Airplane Directorate, 2300 East Devon Avenue, Room 232, Des Plaines, IL 60018; telephone (312) 694-7130, fax (312) 694-7834.

. . . .

Issued in Burlington, Massachusetts on

Pardee

Jay J. Pardee,
Acting Manager, Engine and Propeller Directorate,
Aircraft Certification Service.

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(BY FAX (202) 225-4960)

May 17, 1993

Collin Peterson, Chairman
Sub-Committee on Aviation
House Government Operations Committee
Washington, D.C. 20515

ATTN: Lisa Phillips

Dear Chairman Peterson:

Your office has inquired whether the National Transportation Safety Board or the Federal Aviation Administration or Hartzell Propellor Company ever made any written notification to the State of South Dakota, Department of Transportation relative to the potential for propellor hub failure on Mitsubishi MU2 aircraft after the incident which resulted in the NTSB Safety Recommendation to the Federal Avaiation Administration on August 13, 1992.

The answer to the question is NO.

The South Dakota Department of Transportation had received information from Hartzell Propellor about a propellor blade difficulty on MU2 aircraft. The information from Hartzell subsequently resulted in an air worthiness directive on or about April 20, 1993. In response to the information from Hartzell, South Dakota Department of Transportation replaced the propellor blades on the MU2 approximately eleven months prior to the crash which killed Governor Mickelson and seven others.

Thank you.

Very truly yours,

Lawrence E. Long
Chief Deputy Attorney General

LEL:jp

Mr. PETERSON. I have a number of questions that I would like to put to you at this point, if I could. Has the FAA complied with your Hartzell HC–B4 four-blade propeller hub inspection recommendations that were dated August 1992?

Mr. FORTE. No, sir, with the exception of the most current AD that is dealing with just the Mitsubishi MU–2B–60 airplane.

Mr. PETERSON. You asked for all of the four blade, which are about 1,000?

Mr. FORTE. That is correct. And also to evaluate based on those inspections——

Mr. PETERSON. Whether to go to the three blade——

Mr. FORTE [continuing]. If further inspections were necessary on the three blade or five blade.

Mr. PETERSON. Has the FAA indicated to you that they will comply with your recommendations for inspections of all the Hartzell four-blade hubs, the development with Hartzell of a nondestructive inspection for those propeller hubs, and an evaluation of the design of the three- and five-blade hubs? Have they given you any indication that they are going to move on those issues.

Mr. FORTE. Prior to the April 19 accident it was our interpretation of their communication that they felt it was not necessary. There is, obviously, a lot of activity going on right now, and some informal communication at staff level, but we have not received a formal response.

Mr. PETERSON. So the answer is no at this point?

Mr. FORTE. Right.

Mr. PETERSON. In testimony we will soon hear from the FAA that they—they indicate that they have been working with Hartzell since the fall of 1992 to develop a nondestructive inspection program as you recommended. Have you talked to the FAA or Hartzell to check on this cooperative project?

Mr. FORTE. In communications as recently as last week with Hartzell they had informed us that they were not actively working on an NDI inspection process for these hubs. In conversations this week, they are with the third hub that they found a crack in. They have started in this past week on looking at NDI procedures that would be acceptable.

Mr. PETERSON. Well, they obviously aren't along very far then at this point?

Mr. FORTE. No, sir.

Mr. PETERSON. What is going to happen to the aircraft using the Hartzell four-blade hub?

Mr. FORTE. Those affected by the——

Mr. PETERSON. Right.

Mr. FORTE [continuing]. Airworthiness directive?

Mr. PETERSON. Well, all of the aircraft using—are they——

Mr. FORTE. Well, at this point the Safety Board still has concern that there may be a problem with those, and we would still like to see a response and FAA and Hartzell working on a nondestructive inspection technique that would——

Mr. PETERSON. Do you think the FAA is going to expand the AD under all of these points?

Mr. FORTE. My suspicion is yes, sir, and we certainly hope that they will.

Mr. PETERSON. Do you know that without a doubt?

Mr. FORTE. No, sir.

Mr. PETERSON. How many of the Mitsubishi MU–2B–60—well, you said 45 percent have been completed as of today?

Mr. FORTE. Approximately, sir. There is 80 domestic and 36 operating internationally that are affected by the airworthiness directive.

Mr. PETERSON. So they have sent these propellers to Hartzell and they are conducting the——

Mr. FORTE. The disassembly of the pilot tubes and then the inspection for fatigue cracks.

Mr. PETERSON. You testified they found one crack?

Mr. FORTE. They have found what is now a third hub with a crack indication and they are using that as a test bed, as I understand, to explore nondestructive inspection techniques.

Mr. PETERSON. So it is very similar to what happened with these other two propellers?

Mr. FORTE. We have not seen a formal report, metallurgist's report of the third finding, but in our conversations with Hartzell they have indicated that there is the indication of a crack in the same area.

Mr. PETERSON. And there are two other problems that were found?

Mr. FORTE. Well, two hubs were damaged during the disassembly process, and had to be taken out of service.

Mr. PETERSON. How many hubs has Hartzell been able to inspect on a daily basis?

Mr. FORTE. I don't know, sir. I know—they have indicated to us that most of their resources are going into the inspection process.

Mr. PETERSON. What are they doing when they find a cracked hub during their inspection? They are testing this one. Are they going to replace them then with a new hub?

Mr. FORTE. Yes, sir. As far as the aircraft is concerned, they will replace it with a serviceable hub. The third hub in question right now we understand again is being—they are trying nondestructive inspection techniques on it to determine whether they can develop one that will be feasible, and at some point I am sure they will use destructive testing to try to determine the origin and the cause of the cracking.

Mr. PETERSON. I understand that Hartzell can only manufacture two new hubs a day?

Mr. FORTE. I don't know that.

Mr. PETERSON. You're not aware? That is what we had heard. I was wondering if there are enough replacement hubs available.

Mr. FORTE. I wouldn't know.

Mr. PETERSON. You don't know.

It seems that NTSB's recommendations of an analysis of the design of Hartzell's three- and five-blade hubs have gotten lost in the back and forth over the four-blade hub inspections. What has the FAA done to comply with NTSB's recommendation for the analysis of these other confirmations of the blade hub?

Mr. FORTE. There is no activity that I am aware of that is dealing with the three- or five-blade hubs.

Mr. PETERSON. Has NTSB ever revised its recommendation to inspect all of the four-blade propellers and check the similarity of design and fabrication in the three- and five-blade propellers?

Mr. FORTE. No, sir.

Mr. PETERSON. Now, unfortunately, there has been this catastrophic accident that you have feared. Is the FAA now ready to implement your recommendation?

Mr. FORTE. Well, we believe the airworthiness directive was a proper first step, and we are waiting for a formal response on the actions as we have requested in our recommendations, and we have not received one as yet.

Mr. PETERSON. So, again, I am just trying to get all this on the record. So is their response sufficient for safety purposes, in your view?

Mr. FORTE. We would like to see it expanded to all four bladed.

Mr. PETERSON. NTSB strongly stated that the hub fracture on the Hartzell four-blade hub was a catastrophic accident waiting to happen. Why did you recommend inspections on a level 2 basis, rather than a level 1 emergency basis?

Mr. FORTE. We took into—well, when it initially came in we assigned it to staff for review and they did an analysis of the service difficulty reports and the service history of the Hartzell propeller, and it has had an excellent service history, and because of that it was classified as a priority so we could seek, you know, further ways to develop the inspection process and do it in a timely manner.

We were certainly concerned, and we felt priority 2 or class 2 was the appropriate classification.

Mr. PETERSON. If you had it to do over again, would you have made the recommendations from the Utica incident a class 1 recommendation?

Mr. FORTE. Without the knowledge of the second accident, sir? Without the knowledge of the second accident, it probably would have remained a class 2. Certainly the second accident would have elevated it to class 1.

Mr. PETERSON. So hindsight makes it an easier decision.

Mr. FORTE. Yes, sir.

Mr. PETERSON. What kind of recommendations are level 2 usually? Are most safety and hardware recommendations level 2?

Mr. FORTE. There is approximately—and this is ballpark. Approximately 30 percent of the class 2 are dealing with airworthiness of flight. The remaining 70 percent deal with training issues, crew paring, other noncritical to airworthiness issues. Most of our class 1's are a goodly percentage higher, probably closer to 70 percent are dealing with airworthiness issues.

Mr. PETERSON. So 70 percent of the class 1's?

Mr. FORTE. Approximately.

Mr. PETERSON. And the other 30 percent are?

Mr. FORTE. Are areas like ground proximity warning system, would be an example, where it doesn't have immediate airworthiness of flight but we believe it would prevent future accidents.

Mr. PETERSON. But the level 2 clearly doesn't command as much attention as level 1; is that correct?

Mr. FORTE. Well, that is correct. Of course, we take all of our recommendations very seriously.

Mr. PETERSON. You mention in your testimony that the FAA, as opposed to the NTSB, takes into consideration the cost of its recommendations. Is that correct?

Mr. FORTE. That is correct.

Mr. PETERSON. I wonder if you could clarify something for us. The Utica accident involved a four-blade propeller, right?

Mr. FORTE. Yes, sir.

Mr. PETERSON. And Hartzell and the FAA repeatedly refer in their communications to the cost of replacing pilot tubes in 28,000 hubs, which are three-, four-, and five-blade propellers. That figure represents all of the propeller hubs that Hartzell ever made, as near as I can understand. And Hartzell said that the pilot tube replacement alone for those hubs would be over $15 million.

It was not your initial recommendation to require immediate inspection of all of those hubs, was it?

Mr. FORTE. No, sir. It was just the four-blade propeller.

Mr. PETERSON. Would all of the 27,000 plus blades mentioned by Hartzell still be in service or have over 3,000 hours of airtime?

Mr. FORTE. Of three, four, and five blade, Mr. Chairman?

Mr. PETERSON. Yes. Are they all in service yet?

Mr. FORTE. My understanding of the hubs is that they are an on-condition item, and so that unless they were damaged in an inspection process or in an accident there is probably a goodly percentage that are still in service. Of the four-bladed hubs, there were approximately 6,000 manufactured since 1963, I believe is when they started that design.

Mr. PETERSON. And about the 3,000-hour level, do you know how many?

Mr. FORTE. Even in the Mitsubishi MU–2B–60 airplane, for example, we believe there is about 200 hubs affected. Of the aircraft, 136—it's about 60 percent of the hubs that are out there on the Mitsubishi MU–2B–60.

Mr. PETERSON. In the July 2, 1992 memorandum, from NTSB's Managing Director to the Board, it noted that there was 6,000 four-blade propellers that had been manufactured since 1977 but only 1,000 of them were still in use at that time. Is that right?

Mr. FORTE. I actually believe that that letter mischaracterize the 1,000. What I believe it intended to say was that there is 1,000 hubs in service on Mitsubishi aircraft—all series, not just the MU–2B–60—and there are many other model aircraft that use that same hub design beyond the Mitsubishi.

Of the 6,000 that were actually manufactured, how many are still in service is probably close to the original number, but I am certain that many of them are out of service. Less than 1,000 on Mitsubishi.

Mr. PETERSON. But, in any event, whatever the number is, it would be a much lesser cost for replacement. If you focus in on just those propellers, then it wouldn't.

Mr. FORTE. If you focus in on just those over 3,000 hours, yes, sir. And, if you focus even narrower on the Mitsubishi, much less.

Mr. PETERSON. Well, yes. I think if we looked at just the Mitsubishi it would be 540,000 or something in that neighborhood. Is that——

Mr. FORTE. Approximately, sir.

Mr. PETERSON. I want to refer to the September 10 memorandum from Richard Ettinger of Hartzell Propeller to Tim Smith of the Chicago FAA office. Mr. Ettinger told Mr. Smith that there was no justification, especially considering the economic impact, for NTSB's recommendations to inspect all three-, four-, and five-blade propellers.

We have already determined that that was not NTSB's recommendation, is that right?

Mr. FORTE. That is correct.

Mr. PETERSON. Hartzell then suggests that the issuance of a service bulletin aimed at the Mitsubishi MU–2B–60 aircraft, and perhaps other similar Mitsubishi aircraft, may make more sense. Prior to last month's fatal crash of the MU–2B–60 aircraft, did the FAA ever suggest to the NTSB that it was willing to issue an airworthiness directive requiring inspection of the propeller hubs only in the MU–2B–60 aircraft?

Mr. FORTE. No, sir.

Mr. PETERSON. What happened to that proposal by Hartzell?

Mr. FORTE. I'm not familiar with that Hartzell—NTSB did not see a copy of that that I know of.

Mr. PETERSON. I think we have a copy in the—you never saw that?

Mr. FORTE. It was from Hartzell to the FAA?

Mr. PETERSON. Right. I believe.

Mr. FORTE. I don't believe so, sir. It is not in our docket that I recall.

Mr. PETERSON. That was their—maybe we can have the staff find it for you.

Mr. FORTE. Are you referring to the Hartzell metallurgical report?

Mr. PETERSON. Well, their initial response was that they should look at just the Mitsubishi MU–2B–60 aircraft and they ought to inspect them. That was the original, first letter that we saw from Hartzell. And I guess my question is, you know, if that would have happened, we probably would have been able to avoid this tragedy.

Mr. FORTE. I agree with your analysis.

Mr. PETERSON. It is dated September 10, 1992.

Mr. FORTE. September 10, 1992?

Mr. PETERSON. Yes.

Mr. FORTE. I don't believe that is in our docket.

Mr. PETERSON. There is a manila packet.

Mr. FORTE. I have it here. I am going through it.

Mr. PETERSON. Maybe somebody from the staff could help him.

Anyway, what it says here is that "We have been studying the NTSB recommendation concerning the Mitsubishi MU–2B–60 hub failure. We believe that there is currently no justification, especially considering the economic impact . . . " and so forth. Then it says in the next paragraph, "As we discussed today, the issuance of a Service Bulletin aimed at the MU–2B–60 aircraft, and perhaps other similar Mitsubishi aircraft may make more sense."

Mr. FORTE. I can review our docket again, sir, but I don't believe we have this correspondence.

Mr. PETERSON. That was one of the things that I was just, you know, all this talk about $15 million and examining all of these hubs, you know, and here the company was saying what seemed like to be the most sensible thing to do, and that is to focus in on this aircraft.

Mr. FORTE. It would have certainly been timely and at least partially responsive to our recommendations. But internal communications between Hartzell and the FAA, unless we are a party, we would not typically have access to.

Mr. PETERSON. You wouldn't necessarily get this?

Mr. FORTE. No, sir.

Mr. PETERSON. For the nontechnical people here, would you describe what this nondestructive inspection technique is?

Mr. FORTE. Well, there are several nondestructive inspection techniques. Visual would fall into that category. A magnetic particle, eddy current, x ray and ultrasound are examples, and it is basically keeping a part serviceable through an inspection process. A destruction method might be actually sawing through a part where a fatigue crack is and do a closer examination under an electronic scanning microscope, for example. So there are many nondestructive techniques available.

Mr. PETERSON. So there are a number of them that are available?

Mr. FORTE. Yes, sir.

Mr. PETERSON. But they have not designed one for this particular situation?

Mr. FORTE. Well, they use the magnetic particle inspection as part of the 3,000-hour, but that is not an adequate inspection process without the pilot tubes being removed. And the pilot tubes are not required to be removed in the overhaul process. They are an on-condition part also. So we felt and suggested in our initial letter that ultrasound probably had the best possibility of being able to detect flaws in the area we were concerned as a nondestructive process without having to remove the pilot tubes, and we asked them to develop an inspection program that would accomplish that.

Mr. PETERSON. In its prepared testimony, which we are going to receive here shortly, the FAA states that it felt that it would not be appropriate to issue an AD until—and I am quoting on this—"an effective inspection could be developed that would not require the removal of the pilot tube." The FAA's responses to the NTSB never mentioned that the FAA was trying to develop a nondestructive inspection method. They say categorically that an inspection is not necessary.

Between September 1992 and April 1993 was the NTSB ever told that the FAA was developing a nondestructive method of inspection?

Mr. FORTE. No, sir. Not to my knowledge.

Mr. PETERSON. In fact, when the inspections began earlier this month the propeller hubs and pilot tubes had to be pulled off, didn't they?

Mr. FORTE. That is correct. Because there was not a nondestructive technique that they knew for certain would discover the faults.

Mr. PETERSON. I have some more questions, but maybe I will turn this over to other members here, if they wanted to jump in at this point. Mr. Johnson looks like he is up at the microphone here first.

Mr. JOHNSON. Well, thank you, Mr. Chairman, for the opportunity to ask a couple of questions on this committee's deliberations.

Could you elaborate a bit on the criteria that the FAA uses in determining whether to accept or reject recommendations from the NTSB? Is this a subjective, "fly by the seat of the pants" sort of thing, or are there specific criteria that they use?

Mr. FORTE. As far as the FAA's criteria, I mean, I would feel a little awkward trying to answer for them.

Mr. JOHNSON. All right.

Mr. FORTE. And it probably would be more appropriately directed toward them.

Typically, we have very good communications, and they are normally responsive to our recommendations, as the record shows. In this case, obviously not.

Mr. JOHNSON. Are you aware of any other instance where the NTSB's recommendations have been rejected, and subsequent to that rejection an accident has occurred resulting from the problems previously pointed out by the NTSB?

Mr. FORTE. Yes. We don't track that specifically like that, so in discussions with the staff, we came up with several that—three actually, I think there was a fourth I can't recall. One dealt with a DC–10 cargo door. One did deal with the issue of ground proximity warning systems. And one dealt with winter operations and anti-icing.

Mr. JOHNSON. Have these been recent occurrences?

Mr. FORTE. No, sir. Well, the winter operations was closed acceptable this past year, and the actions that the FAA took. But there had at one point been an unacceptable response and further icing accidents occurred.

Mr. JOHNSON. Is it common to have to devise new, nondestructive inspection techniques in order to comply with the recommendations of the NTSB?

Mr. FORTE. It is not necessarily a new technique. It is determining which of those that are available works best and will actually or categorically catch the defects that we were most concerned about. And, ultimately, if none of those nondestructive techniques would work, then we would have to review the analysis that was provided to us, and likely staff would have recommended removal of the pilot tubes, at least on the four-blade propeller house.

Mr. JOHNSON. All right. I have no further questions at this moment, Mr. Chairman.

Mr. PETERSON. Thank you, Mr. Johnson.

Mr. Flake.

Mr. FLAKE. Thank you very much, Mr. Chairman, I have several questions.

First of all, let me ask if Hartzell is a sole source contractor with DOT? You don't know that.

Mr. FORTE. I don't know if they are a contractor with DOT at all.

Mr. FLAKE. Therefore, the reality is we don't know whether they are the only ones making this particular type of engine or not?

Mr. FORTE. Well, it is a Hartzell-manufactured hub, and they are a private enterprise. I mean, I don't know if they have any contracts with any Federal agency.

Mr. FLAKE. Do they sell them to the market?

Mr. FORTE. Yes.

Mr. FLAKE. OK. On page 7 in your statement you claim that the "FAA noted that Hartzell was conducting extensive analysis to verify propeller hub stress levels. The Safety Board on March 4, 1993, once again noted that the FAA was not responsive to the recommendations and encouraged the FAA to develop an inspection method that could effectively detect flaws in the propeller hub without the removal of pilot tubes."

I suspect this is a follow-up to your statement on page 6 that the Safety Board also recognizes that inspections prescribed for the propeller hub in the Hartzell service manual were not adequate to detect the initiation of a crack in the area noted. The Board noted that an inspection technique that would require removal of the hub-to-blade pilot tubes from the hub arms would be costly and would present some risk of introducing new damage during the disassembly and assembly process. The Safety Board believes that inspection methods, possibly using ultrasonic technology, could be developed to detect propeller hub arm cracks without necessitating removal of the pilot tubes.

Has any of this been implemented, to your knowledge, to avoid any potential future catastrophes?

Mr. FORTE. As a result of the April 19 accident there is inspections being performed on all Mitsubishi-60 airplane hubs with over 3,000 hours, and that includes removing of the pilot tubes and doing—it actually is magnetic particle inspection, which is adequate with the pilot tubes removed. With them installed, it would not work. And they are this week, literally, working on developing nondestructive inspection techniques.

Mr. FLAKE. Is that inclusive of the ultrasonic technology, or have they developed some other process that is——

Mr. FORTE. Ultrasonics being explored to see if it will be successful in identifying these kinds of cracks.

Mr. FLAKE. Now, the suggestion here is that part of the decision to not use this process had more to do with cost than it had to do with concern for life necessarily. Would that be a correct assumption?

Mr. FORTE. Well, the FAA as a rulemaking and regulatory agency is required by law to consider economic impact. The Safety Board is not. And we felt strongly about our recommendation.

Mr. FLAKE. Is that a point of departure between the two agencies, where between this crack, perhaps, emerged the problem that ultimately led to the crash?

Mr. FORTE. No, sir. I think it is appropriate that the NTSB is not a regulatory agency or a rulemaking agency because it allows us to not couch our safety concerns with any other considerations other than safety.

Mr. FLAKE. Is it reasonable to say that your agency primarily deals with the safety question and the issue of cost is not a part of your analysis?

Mr. FORTE. While we recognize real world constraints, in many of our recommendations that are acted upon favorably, lots of times some of the parts are not available and so they will be implemented over a period of time. We recognize that as being appropriate. But we do not consider the economic impact or apply regulatory flex act to any of our safety recommendations.

Mr. FLAKE. If all of the recommendations you have made are fully implemented, does it mitigate the possibility of future catastrophes of this nature in a meaningful way?

Mr. FORTE. Well, I mean we certainly believe so as it deals with fatigue cracking and the Hartzell hub. Yes, sir.

Mr. FLAKE. And have those recommendations been received favorably?

Mr. FORTE. The correspondence to date is not acceptable and our current status of those recommendations are open, unacceptable response. There is, obviously, activity going on now as a result of the April 19 that we believe is a good first step, and we are looking forward to the analysis of what they are doing and what other actions they are proposing, and whether or not that will be responsive to our recommendations.

Mr. FLAKE. Is congressional action needed in order to force the reception of these recommendations in a more favorable light?

Mr. FORTE. I believe there already is congressional action.

Mr. FLAKE. Well, this is a beginning. But I am suggesting legislative action versus just hearings?

Mr. FORTE. That is a difficult question for me to answer, Congressman. You know, I believe that the FAA is on the right track now, and we hope that it will ultimately end in us finding their actions acceptable.

Mr. FLAKE. It is my hope, then, that the Congress and all bodies involved will work to ensure that there are solutions prior to rather than after the fact in the future. I think that the chairman of this subcommittee and all of us would be concerned about how we might be as helpful as possible in making sure that wherever there are dichotomies we play a major role in assuring that those gaps are closed quickly before there is another death.

Thank you, Mr. Chairman. I yield back.

Mr. PETERSON. Thank you, Mr. Flake. We appreciate those questions.

Mrs. Thurman, do you have——

Mrs. THURMAN. This really goes to something that's more—and I guess it was a letter that you had requested some information from the attorney general's office in South Dakota that actually evidently had talked about asking if there had been any written notification of any kinds of problems and the answer was no. But in the second paragraph it means that there had been information from Hartzell that actually had talked about another problem with some blades prior to that.

Can you give me what your standing operating procedures are for notification?

Mr. FORTE. And I believe what you are referring to in the notification was a service bulletin by Hartzell that was dealing with the pilot tube and at the end where the blade attaches, not where it attaches to the hub, so it is a different area. And that service bulletin is in the process of becoming an airworthiness directive. It is out and it is a NPRM now, I believe.

There are a number of vehicles for dissemination of our safety recommendations and reports. The media certainly want and the major reports obviously get that kind of attention. There are also any number of trade magazines—AOPA, for example—who report regularly on the activities at the NTSB.

Additionally, we have an aviation—all of our information is public and it is available on request by anyone. We have a standard mailing list that is quite extensive. I have a copy of that and I will be happy to provide it for the record, if the chairman so like. That include any number of aviation communities, universities, repair stations, FAA facilities, some State aviation departments. South Dakota is not on that list.

There is a pretty wide dissemination, although there is not a standard format for disseminating. However, we frequently do make recommendations to inform all users of the findings of a particular accident report and they are almost—they always are acted on favorably because that is an easy recommendation to act favorably on.

And then in the case of where we are recommending an airworthiness directive, if that is acted upon favorably, all users are notified.

Mr. PETERSON. Following up, I guess this has been some of my—Mrs. Thurman has hit on some of my concerns there. Do you think that you should more accurately inform the flying public when the FAA refuses to implement your recommendations? I mean you have stated all the different things that happen now. Do you think that we ought to——

Mr. FORTE. Certainly a more informed public is always something that is positive, Mr. Chairman, and there are a lot of vehicles out there currently. One of the ones I forgot to mention, to Congresswoman Thurman, is a general aviation airworthiness alert that is published monthly by the FAA and automatically sent to repair stations and inspectors and part 135 operators to do something that would provide a greater opportunity in one of those circumstances that, you know, it wouldn't hurt, and I know your feelings on the subject and informing pilots. You know, certainly the staff at the NTSB would support that.

Mr. PETERSON. Yes. Well, let's get it clear. Would you support the concept of the FAA sending bulletins on incidents and accidents to the owners and operators when your recommendations, you know, are not acceptably resolved by the FAA. In other words, when you have an unacceptable condition like you had in this situation, that there be a requirement that the information in this Utica incident, for example, be made available to the owners and operators of that type of aircraft.

As a pilot, if somebody was flying a C–35 Bonanza like I have and something happened like this, I would like to know. I mean, you know, when we fly we take on, you know, all kinds of information and make decisions about, you know, what we ought to do, whether it be weather, whatever. And it would just seem to me as a pilot or as an owner of an aircraft that I would like to know as much as I can about what I might be confronted with, and I don't believe that these folks knew about this. You know, I might have been publicized or it might have been in some paper or magazine or something, but I really doubt that they knew about this incident. And I have to believe, especially with it being a State plane that carries the Governor a lot, that had they known they would have probably pulled these propellers and taken a look at them.

So I guess my interest in this is that, you know—apparently you think that this might not be a bad idea to look into something like this?

Mr. FORTE. Yes, sir.

Mr. PETERSON. Would it take legislation to do this, or could this be done by you or the FAA or, I don't know, whoever would do it?

Mr. FORTE. Well, it would—I don't believe legislation would be required. I mean it would be the original equipment manufacturer or the FAA who maintains those kinds of registries that you are talking about, and I think you are speaking to unacceptable recommendations that are dealing with an airworthiness nature. And, while I can't speak for the five-member Board on how they would vote on it, I believe the staff would support that. Yes, sir.

Mr. PETERSON. Why hasn't this ever been considered before? We have not ever had an incident, a situation like this?

Mr. FORTE. It has been very few in discussions with the staff that we could call similar situations where we had open, unacceptable responses and another fatal accident occurred.

Mr. PETERSON. It happened, though.

Mr. FORTE. Fortunately, it is rare. But again, I am a more informed pilot. Although I am a little concerned that if the pilots called Hartzell in this case, for example, they probably would have received an answer, "Don't do anything. We don't know that we have a problem," may have been their initial response while they were investigating how the——

Mr. PETERSON. Well, I understand that. But I guess it just seems to me that it is helpful as a pilot to know that this incident happened and what happened to the aircraft after it happened. That it was hard to control. That it vibrated. That kind of information, I think, is useful.

Mr. FORTE. Yes, sir.

Mr. PETERSON. And that there was a loud bang. And so you are flying along and there is a loud bang and it starts to vibrate, you know, you know somewhat what you are involved with. I mean one of the things that we will never know is when they were cleared down to a lower level because of oxygen, apparently they didn't know that they couldn't maintain altitude until they got down there. You know, it is still hard for me to understand how they could lose that much altitude being that close to the airport, if they were cleared direct. I mean getting from 28,000 feet down to within 25 miles is a pretty steep descent.

Mr. FORTE. They were in a rapid descent; yes, sir.

Mr. PETERSON. Right.

Mr. FORTE. Clearly one of the areas our investigation is focusing on is why the aircraft wasn't able to maintain altitude, and clearly precipitated by the loss of the propeller, and, obviously, a pressurization problem that was on the air traffic tapes. But we are going to try to focus on why the aircraft didn't maintain flight.

Mr. PETERSON. Mr. Johnson, do you have any further questions?

Mr. JOHNSON. This plane was certified to fly with one engine.

Mr. FORTE. Yes, sir.

Mr. JOHNSON. So there has to be another contributing factor to this tragedy apart from simply the propeller hub failure?

Mr. FORTE. Yes, sir.

Mr. JOHNSON. All right. I have no further questions.

Mr. PETERSON. Thank you, Mr. Forte. We appreciate your being with us, and your patience toward our delay. Hopefully, some good will come out of our discussion. Thank you.

Mr. FORTE. Thank you, sir.

Mr. PETERSON. Next, we have Mr. Anthony Broderick, Associate Administrator for Regulation and Certification with the FAA, accompanied by Tom McSweeney, the Director of the Office of Aircraft Certification.

Welcome to the subcommittee. Mr. Broderick, would you identify the person accompanying you?

Mr. BRODERICK. Yes, sir, Mr. Chairman. With me is Tom McSweeney. He is Director of the Aircraft Certification Service in the FAA.

Mr. PETERSON. It is the custom in the Government Operations hearings which are investigative hearings to swear in all witnesses, so that we do not discriminate against any of them.

Mr. Broderick and Mr. McSweeney, do either of you have objection to being sworn in?

Mr. BRODERICK. No, sir.

[Witnesses sworn]

STATEMENT OF ANTHONY J. BRODERICK, ASSOCIATE ADMINISTRATOR FOR REGULATION AND CERTIFICATION, FEDERAL AVIATION ADMINISTRATION, ACCOMPANIED BY TOM McSWEENEY, DIRECTOR, AIRCRAFT CERTIFICATION SERVICE

Mr. BRODERICK. Mr. Chairman, to help us discuss this, what I would like to do is, if I could, have you enter my prepared statement in the record, pass out a sketch that we made this morning that will help with nomenclature a little bit.

I have with me a section of a Hartzell propeller. This is the propeller hub that we have been investigating, and I thought it might help to explain a little bit why it is taking so long to develop nondestructive test techniques and what the problems are that we face.

This hub is one of the four hub arms on a propeller. This is the pilot tube that has been discussed already, which is forced into this single-piece steel forging. This is a force fit, and to remove it takes anywhere from 8,000 pounds or more of force on up. There is a very tight fit here. This is one of four blades or four elements on the propeller, and effectively right now you are looking at the nose of the aircraft. This would be one blade sticking up here.

The purpose of the pilot tube is to provide for a stiff fit when you slip the blade over it, and then you clamp the blade and hold it on down there. This is a single piece, very large, heavy, aircraft grade, stainless steel forging that is used for the construction of the hub. The hub, like a landing gear, cannot be built in a fail-safe mode because of the way it operates.

So we make sure when we approve designs like this that the stresses that are applied to the hub are far below the normal stresses that are incurred in day-to-day flight. That is the case here, and effectively this has an infinite life, as Mr. Forte indicated. As a practical matter, there have been about 114,000 of these hub arms put into service over the last 30 years by Hartzell on various three-, four- and five-blade propellers. They have accumulated something over 60 million flight hours, and until the Utica incident in April 1991, 20 years—I am sorry—30 years, or nearly so, after their introduction into service, there had never been a single failure of this piece.

The failure that we are talking about that occurred in Utica, that appears to have occurred in the tragic accident involving the Governor, and appears to be something that might be a precursor indication of the crack that we have seen in our inspection occurred way down at the bottom inside this forging beneath the pilot tube. So it is at the bottom on the inside wall of this single forging. You cannot——

Mr. PETERSON. See it. OK.

Mr. BRODERICK. You can't get at it from this side. This is the engine drive shaft connection here.

Mr. PETERSON. Turn it this way. You can see inside of the——

Mr. BRODERICK. You can in fact, and that is why it is about to—it is awfully heavy.

Mr. PETERSON. Yes.

Mr. BRODERICK. What you can do is put a probe inside. What you are effectively doing is trying to put a probe down below the pilot tube but just below the pilot tube.

Mr. PETERSON. You have to pull the propeller off and take those clamps off.

Mr. BRODERICK. In order to get to this, you must take the propeller off the airplane, take the blades off the propeller so that you have a four-piece section in this case.

Mr. PETERSON. You can't leave that on the plane like that and just take the blade off?

Mr. BRODERICK. You could if you had a technique to inspect it ultrasonically or by eddy current. We have no probes now that will detect a tiny crack inside here that we can use today. The only way that we know of to detect a crack in here is to take this now off this, as we are doing with the four-blade props on the Mitsubishi MU–2B–60. Take it off; bring it back to the Hartzell factory, because as Mr. Forte indicated there is a question of possibly damaging the hub when you disassemble this; put this on a special press and literally apply many tons of force to pull this pin out. If you haven't damaged the hub, and we are running a little bit more than 5 to 7 percent scrap rate, you then inspect the hub for cracking and, as noted, rework it and put new tubes back in.

Mr. PETERSON. I should have asked you this the other day when you were in my office. But, you know, they look inside of people with these probes, different places.

Mr. BRODERICK. It is called a borescope in aviation.

Mr. PETERSON. Why couldn't you use something like to look inside it?

Mr. BRODERICK. You can, sir. But the problem that we have is we are looking for the scratches that are discussed in the NTSB recommendation that gave some concern; they are only a few thousandths of an inch deep, and this is something that has been in service, perhaps, for 5 or 10 or 15 or 20 years. There is accumulated dirt and grime in there. You can't just simply look in there. You have got to have a way to clean this surface and get a good visual examination.

Mr. PETERSON. That is mostly what you have to do. You have to clean it so that you can see what is there.

Mr. BRODERICK. That is correct.

Mr. PETERSON. I see.

Mr. BRODERICK. The only way we have been able to detect the crack that is actually—has been found is to disassemble the hub—that is the problem.

Mr. PETERSON. There isn't any way to clean it leaving that on there?

Mr. BRODERICK. Not that we have yet found that will permit you to detect the crack visually. Your eye is just not good enough. We are looking at, and I might point out that Hartzell——

Mr. PETERSON. Excuse me. But don't these probes magnify, I mean?

Mr. BRODERICK. Well, they can. But if there is a layer of dirt or grime covering things they won't, still won't see beneath it. You are looking for tiny cracks. You really need something with electronics.

Mr. PETERSON. Couldn't you put a lot of pressure, something to squirt in there and——

Mr. BRODERICK. Well, they will be looking at all of that. But I don't think cleaning is the issue. I think what we need is some kind of electronic device, an ultrasonic device, an eddy current device or something. Right now we have used a nondestructive technique called magnetic particle inspection. After you pull this out the hole is bigger. It is a lot easier to see in there, and you can magnetize this steel and put particles on it to see where cracks are because of the discontinuity in the magnetic field.

But I thought it would be helpful to look at the actual part, and let me mention a couple of other things. Something that is very important is the fact that there are about—nearly 7,000 of these propellers, which should be 28,000 of these hubs for four-blade propellers. There are about 27,000 propellers, or over 75,000, close to 80,000 of these hub arms for three-blade propellers. You couldn't tell the difference. In fact, I don't know whether that is a three-blade or a four-blade hub arm. They are identical.

What that means is that if we have the kind of difficulty that we have now seen, that is, a crack that propagates in a very low-stressed area, there is not a lot of stress involved here, we don't know why it is propagating and we need to find that out. Tomorrow we are starting, if things continue to go well, inflight tests that were directed by the FAA that Hartzell conduct to remeasure with an instrumented propeller all the stresses and strains in here that are relevant, and we will redo the mathematical modeling to try and understand the distribution of those stresses and strains so that we can do what you were discussing earlier. Take from the 35,000 propellers or 100,000 hubs that we have out there, get rid of those that don't present a problem from the technical viewpoint and only focus on an inspection of some kind yet to be determined on the others.

In the case of the first incident, we had one incident on 114,000 hubs, had no idea whether it was a Mitsubishi MU–2B–60 or any other kind of pattern that was developing. We were working with Hartzell, but frankly, not at the priority that has been accorded this action since the April 19 tragedy. But we were working with Hartzell and our own specialists to try and figure out a way to get a probe in there and get an appropriate signal out.

As you can see, when we saw a pattern—that is, the second incident occurred involving the tragic accident—we immediately said this is now a pattern, we are immediately going to pull out all the stops and do something extraordinary, and that is, forget the NTSB recommendation that we develop a new technique, which has been our roadblock, and go right to the old-fashioned technique, the one that we know will work, pull all the propellers back to the factory, so that we can carefully control the maintenance, and make sure that we inspect each and every propeller.

We are considering broadening that AD today to include other aircraft. We haven't yet decided which aircraft and we won't make that decision until the results of the strain survey that starts tomorrow and the modeling are in. But if, in fact, we can see a reasonable pattern developing in terms of our technical data, we are not going to wait to develop a nondestructive inspection technique because of the safety implications.

Meanwhile, however, Hartzell has, in fact, hired a full-time, nondestructive inspection specialist. We have put our world expert in nondestructive inspection full time on this job. We also have our national resource specialist in fracture mechanics working on understanding the loads and their distribution within the propeller hub assembly, so that we can do everything that we can to develop the testing rationale—that is the key. Then using that rationale, apply a test as rapidly as possible to every reasonable propeller. It may, in fact, be something that 2 weeks from today or 3 weeks from today we can lay out a very clear cut and logical explanation as to what we have done and why we have done it.

It also may be something that still is a mystery at that time, in which case we have to seriously look at the other four-blade propellers. There are nearly 7,000 of them. At the rate of inspection we are talking about today, that is 3 years' worth of inspections, roughly speaking.

Mr. PETERSON. And it is going to take you 2 or 3 weeks to know what you are going to do? Is that the timeframe we are looking at?

Mr. BRODERICK. Actually, I hope we will know sooner than that. I was just picking that as an arbitrary number. Unfortunately, when you have an unknown, the only thing that we can do is put every resource we have as an expert on that to try and understand it and take action. That is what we will do, sir.

We will be happy to answer any other questions you have.

[The prepared statement of Mr. Broderick follows:]

STATEMENT OF ANTHONY J. BRODERICK, ASSOCIATE ADMINISTRATOR FOR REGULATION AND CERTIFICATION, FEDERAL AVIATION ADMINISTRATION, BEFORE THE HOUSE COMMITTEE ON GOVERNMENT OPERATIONS, SUBCOMMITTEE ON EMPLOYMENT, HOUSING, AND AVIATION, CONCERNING THE FEDERAL AVIATION ADMINISTRATION'S RELATIONSHIP TO THE NATIONAL TRANSPORTATION SAFETY BOARD. MAY 19, 1993.

Mr. Chairman and Members of the Subcommittee:

I welcome the opportunity to appear before the Subcommittee today to discuss the relationship between the FAA and the NTSB concerning, in particular, the way in which FAA responds to safety recommendations proposed by the NTSB. I understand that the Subcommittee's interest in this area was heightened by the tragic accident on April 19 of a Mitsubishi MU-2B-60 aircraft in Dubuque, Iowa.

Any review of the FAA and NTSB relationship must, of course, consider the two agencies' missions. The NTSB was established by Congress to investigate accidents, make determinations of probable cause, and to make safety recommendations to the regulating agency. In 1974, Congress acted to make the NTSB an independent agency to help assure the independence of its accident findings and safety recommendations. FAA is charged by the Congress with the job of promoting the safety of our air transportation system through regulation, surveillance, and enforcement. One way that we fulfill our safety responsibilities is through the opportunity to benefit from the NTSB accident findings and the recommendations they make to us. The U.S. aviation safety record, which continues to improve in all segments of air transportation, reflects the fact that concerns for the safety of our Nation's air travelers occupies the highest priority with both agencies.

In my current position, I have worked closely with NTSB officials for more than a decade. Today's working relationship is, in my view, a positive and constructive one. I firmly believe that we have as good a working relationship today as we have ever had with the NTSB. Recently, FAA Acting Administrator Del Balzo met with NTSB Chairman Vogt to discuss ways we could build on that relationship, and continue to improve interaction between the agencies.

We recognize that we benefit from many of the technical recommendations made by the NTSB, and we carefully weigh all safety information they provide. In fact, the historical record of FAA's response to NTSB recommendations shows the value we place in their input, with more than 80% of "closed" NTSB recommendations having been adopted. We have adopted more than 90% of their Class I (urgent) recommendations. Nevertheless, there are--as there should and will be--times when we differ on a particular course of action that should be taken by the FAA. Despite these differences, we are able to find common ground more often than not, and the safety dialogue between the two agencies does advance the safety interest of the traveling public.

To ensure timeliness in responding to NTSB recommendations, we have established a process for tracking each recommendation. We have consistently met the 90 day requirement for initial response to an NTSB recommendation. We also continue to track and monitor the status of FAA review and action on each recommendation until final action is taken by the agency.

A recent review of our responses to NTSB recommendations shows that this control process is working well, with FAA actions needed to close out NTSB recommendations falling within the prescribed timeframes. More specifically, the DOT Inspector General found that, except in the case of the lowest priority recommendations (Class III (long term)) where we exceeded the 5 year timeline by an average of 6 months, the FAA's time to close out NTSB recommendations averaged less than the timeframe the NTSB assigns to each category. Class I recommendations call for close-out in 1 year; on average, it has taken FAA 7 months. Class II recommendations call for close-out within 2 years; FAA has averaged 22 months.

In view of the Subcommittee's expressed interest concerning the FAA's response to the NTSB Class II recommendation associated with the Hartzell propeller, let me briefly touch on that subject.

On September 27, 1991, a Canadian-registered Mitsubishi aircraft, equipped with a Hartzell HC-B4 propeller, lost a propeller blade in flight. The aircraft sustained severe damage, but was able to land safely in Utica, New York.

NTSB subsequently wrote the FAA on August 13, 1992, making recommendations concerning the Hartzell propeller. In its letter, the NTSB indicated that it had found that loss of the propeller blade was the result of fatigue cracking that started from the inside surface of the propeller hub arm. The NTSB had found scratches inside this area, and believed that these scratches may have provided an origin point for the cracking, and that they may have resulted from the manufacturing process. Accordingly, the NTSB recommended that the FAA, with the assistance of Hartzell, develop a non-destructive inspection technique to detect the type of crack believed to have resulted in loss of the propeller. The NTSB recognized in its letter that an inspection that required disassembly of the propeller and pilot tube could result in damage to the hole wall. The development of a non-destructive inspection technique would be designed to permit the inspection with the pilot tube in place, to avoid this possible maintenance-induced problem. The NTSB also recommended that FAA take action to require the inspection of Hartzell HC-B4 propeller blades with 3,000 or more hours, either at their next overhaul or annual inspection.

The FAA responded to the NTSB's August 1992 recommendations on October 26, 1992, advising the NTSB that we were reviewing the service history of the Hartzell propeller hubs to determine the magnitude of the problem. We also advised them that we were reviewing the service manuals to determine what changes, if any, needed to be made. Although we failed to include this information in our response to the NTSB, we had already begun discussions with Hartzell to seek to develop a non-destructive inspection technique for the propeller hub.

On January 4, 1993, we followed-up on our earlier response to the NTSB's recommendations. We informed them that, while we agreed with the intent of their recommendations, we did not believe that airworthiness directive action was necessary, at that time, to require the inspections NTSB had recommended. We also informed the NTSB that Hartzell Propeller analysis had shown that stress levels of the propeller area in question were acceptable, and that no metallurgical discrepancies were found in the hub material. We also said Hartzell would continue its investigation and would provide us with its findings. Further, FAA would continue to monitor the service history of the propeller hub design.

In response to our January 4 letter, the NTSB wrote the FAA on March 4, 1993, reiterating its view that an appropriate inspection technique, not requiring disassembly of the HC-B4 propeller pilot tube, be developed and applied. The NTSB also noted concern that the FAA had not seen a need to review the design and fabrication of other types of Hartzell propellers using the same type of hub design.

Although the correspondence between the agency and NTSB highlights the issues and some of the background, it does not fully depict our reasoning or the nature of the activities we had underway within the agency. Perhaps most important is the fact that, at the time of the Utica accident, there had been no other comparable Hartzell blade fractures for either that or any of the other similar hub designs despite three decades of use and some 60 million hours of service by 110,000 propeller hub arms.

One action we took was to review all the known service difficulty history on the Hartzell HC-B4 propeller hub design, which totals over 6,000 4-bladed propellers. We also contacted several propeller overhaul shops to gather data on any known cracking problems with this propeller design. Thousands of propeller hub pilot tubes had been pulled out during normal scheduled maintenance work, and not one crack had been reported in the hub arm failure area.

The Hartzell propeller steel hub type design configuration includes approximately 35,000 propellers for all models in service worldwide. The Hartzell steel hub design has over 60 million flight hours to date. The HC-B4, the specific model involved with the Utica accident, has been in service for 20 years with millions of flight hours accumulated.

In light of the successful performance history, in addition to the finding that no cracks had ever been reported in the area of concern in the Utica accident, it appeared to the FAA that the Utica hub failure was an isolated case. We felt it would not be appropriate, based on that information, to issue an airworthiness directive (AD) until an effective inspection could be developed that would not require the removal of the pilot tube. Such an AD would have been a labor-intensive and costly effort, resulting in substantial downtime for aircraft owners. Most important, however, was our concern regarding the possibility of maintenance-induced problems from these thousands of disassembly operations. The safety record we had on the Hartzell propeller, in our view, simply did not justify that type of action. Instead, we continued to work with Hartzell to develop a satisfactory non-destructive inspection procedure along the lines recommended by the NTSB. Many methods, including x-ray, eddy current, and ultrasonic techniques, were reviewed and found to be unusable. Hartzell had concluded that a non-destructive inspection with the pilot tube in place was not possible with current technology. That remains the case today.

The effort to implement the intent of the NTSB recommendation, without introducing new airworthiness problems, was still ongoing when the Dubuque accident occurred on April 19, 1993. This tragic accident involved a Hartzell HC-B4 propeller of the type involved in the 1991 accident. The blade fracture appeared similar based on early investigation; the airplane was an identical model. For the first time, then, there was an indication that the earlier blade problem might have been other than an isolated aberration. Accordingly, on April 28, we issued an emergency AD requiring inspection of the inner surface of the propeller hubs with the pilot tube removed. The AD included the unusual requirement that the disassembly of the hub and inspection must be done at the Hartzell factory laboratory rather than at a certified repair facility. This extraordinary measure was taken in an attempt to minimize the possibility of maintenance-induced error, and maximize speed and consistency of data collection.

At this point, we still cannot account for the cause of the fractures. Engineering data does not indicate that the area of the fractures is subjected to stress loads that would be a likely cause. Analysis is on-going to revalidate the stress load data. Actual flight tests are also being conducted this week. We continue to work with the NTSB on this issue, and are a participant in the accident investigation, which they oversee.

In closing, Mr. Chairman, I can assure you that we are working closely with the NTSB on this issue, and that we do so on other safety issues as well. We also are continuing our work with Hartzell.

That concludes my prepared statement, Mr. Chairman. I would be pleased to respond to any questions you may have at this time.

Mr. PETERSON. You say it will take 3 years?

Mr. BRODERICK. Well, there are about 7,000 propellers out there. At today's rate, we are running about 5 per day.

Mr. PETERSON. Well, if you put an AD on all these planes and said they had to have this inspection in 10 hours, are you telling us you are going to ground 80 percent of the—90 percent of the planes that have these propellers——

Mr. BRODERICK. Certainly don't want——

Mr. PETERSON [continuing]. Because they won't be able to get them inspected?

Mr. BRODERICK. We certainly don't want to. But if, in fact, the strain survey shows that we have got a problem and the finite element modeling shows that those loads are creating a problem and we need to have them inspected and we have no other alternative, we certainly have to consider that. That is the kind of balancing that we have to do every time we get an NTSB recommendation.

There is a safety need. They recommended that we inspect all four-blade propellers. We have no way of doing that today with a nondestructive technique. If we confirm the safety need, we will have to consider taking the kinds of actions that we don't like to see but are necessary in the interest of safety, and that is exactly what we will do.

Mr. PETERSON. Well, we want to thank you for your testimony. You have been provided also a packet of documents which we have received from the FAA, from NTSB, and from Hartzell, and I am going to periodically, in my questions, refer to some of them. These documents include memorandums from the FAA's Boston office, Chicago office, and headquarters here in Washington.

Could you explain the various roles of each office regarding the NTSB Hartzell recommendations?

Mr. BRODERICK. Tom McSweeney is the Director of Aircraft Certification, and Tom reports to me and has a staff of about 800 people that work for him around the world.

Tom, why don't you explain briefly the organizational structure.

Mr. MCSWEENEY. OK. We have divided responsibility up into four pockets around the country as a function of various kinds of products. The office in Boston, what we call the engine and propeller directorate, is responsible to me for all national policy on engines and propellers, both technical policy and procedural policy and rulemaking. So that is the office that I look to for being responsible to me to resolve any issues related to engines and propellers.

The Chicago Aircraft Certification Office is the office that has Hartzell in its geographical area, and therefore is the day-to-day contact between Hartzell and the FAA. That office receives its administrative guidance and direction from the headquarters in Kansas City, but receives national policy on propellers and engines from the Boston office.

Mr. PETERSON. Who is the ultimate decisionmaker, and what is the coordination role of headquarters?

Mr. MCSWEENEY. The ultimate decisionmaker, the ultimate person responsible for aircraft certification is, of course, myself, and I get involved in issues both of accident nature and policy nature of any other kind when that item is of significance.

Mr. Peterson. You received recommendations from the NTSB in August 1992 to develop a nonintrusive inspection of four-blade Hartzell propeller hubs. Was such an inspection possible with the existing technology?

Mr. Broderick. The technology would allow you, as Mr. Forte indicated, to conceive of doing a nondestructive inspection. The question that we had to answer, and we answered in the negative, was could you do it without pulling the pilot tubes out.

Mr. Peterson. So the answer is no.

Mr. Broderick. Well, the technology answer is yes. The practical answer, without pulling pilot tubes, is no.

Mr. Peterson. Did Hartzell ever tell you that a nondestructive inspection technique could be developed?

Mr. Broderick. No. In fact, they have been and continue to be very skeptical about developing a nondestructive technique that will work, again, without pulling the pilot tubes, and frankly, so are we. While it is theoretically possible, as a practical matter it may not be possible. That is what we are working on right now.

Mr. Peterson. In the period between when NTSB contacted you in August 1992 and the April 19 crash in Dubuque, why did you think a one-time visual inspection and the requirement for magnetic particle inspection every 3,000 hours was sufficient?

Mr. Broderick. We, unfortunately, did a very poor job of explaining what we were doing to the NTSB, and if there is one thing I would do over again, I would tell you that we would be much more forthcoming in terms of detail in the letter that we had answered.

In point of fact, we were trying to do—develop not only with Hartzell but with our own people a rationale as to how to go and inspect which propellers. As I indicated, when you look at the identical propellers, you are talking about nearly 35,000 of them. So, in order to focus things down with one data point, only one incident, you have to have a rationale. We didn't have one and weren't able to do that. For example, we weren't able to isolate the cause, a pattern to the Mitsubishi MU–2B–60.

Mr. Peterson. This inspection technique was Hartzell's, so did you then trust Hartzell's inspection procedures which proceeded the 1991 failure more than those that were recommended by the NTSB?

Mr. Broderick. NTSB actually didn't recommend a specific procedure. They said develop a nondestructive inspection technique perhaps using—I think they talked about ultrasonic and x ray. I know at least informally they did. But there isn't a specific technique recommended.

Mr. Peterson. They, obviously, didn't think that what Hartzell had recommended was adequate. Isn't that what they were saying?

Mr. Broderick. That is correct. Because you need to pull this tube out. And what they recommended and what we actually concurred in and were working on was that we needed to develop a nondestructive inspection technique that would allow you to get down in there with that tube in, and we haven't been able to do that yet.

We haven't given up on it, but we haven't been able to do it.

Mr. PETERSON. Mr. Forte testified that Hartzell Propeller told the NTSB this week that they made no effort to develop a nondestructive inspection. So let me know again what exactly were you doing to follow the NTSB directive.

Mr. BRODERICK. Well, Tim Smythe, the person that you mentioned in Chicago, was working literally daily with Hartzell. We have an April 2 letter, which predates the tragic accident by 1 week or more—2 weeks—from Hartzell indicating that they had concluded that it was not possible to do a nondestructive inspection technique. It is our view, and we would be happy to provide for the record indications of why we think so, but we had literally a dozen or so telephone conversations, meetings, minutes—I mean phone calls, things like that, in February, March, and April, early April, talking about nondestructive inspection with Hartzell.

Mr. PETERSON. Well, is Mr. Forte wrong?

Mr. BRODERICK. No, I don't think he is wrong. I think I would like to look at precisely what he said, but basically I think he said it wasn't a high priority or something like that, and I would absolutely agree with that. It wasn't that they were absolutely not doing anything. I mean I can tell you right now that we started in September and August talking with them about nondestructive inspection. Now whether they believed it, whether they thought they were going to be able to do it, I can't tell you. I can tell you that they were quite negative about it because of the difficulty. We would have to agree.

Since this tragedy we have been working literally 7 days a week trying to figure out a way to do the nondestructive inspection in that confined area, and we can't do that. Cannot figure out how to do it.

Mr. PETERSON. But he did say they absolutely weren't doing anything?

Mr. BRODERICK. That is what somebody—he didn't say that just a few minutes ago, I don't believe. And I think really, frankly, you would have to ask Hartzell. I mean we have provided you with all the documentation we have. You have a copy of the April 2 letter that they wrote to us, which in our view is a sort of concluding letter to their investigation. In our view, they were working, again not at the priority that we have accorded this since April 19, but they were working on that and they had concluded in early April that it couldn't be done.

Mr. PETERSON. Well, the FAA was told by Hartzell in September 1992 that they believed there was no justification for an inspection, but that a possible service bulletin for the Mitsubishi MU–2B–60's could be sent out. Was that service bulletin relative to hub cracks ever sent?

Mr. BRODERICK. No, it wasn't. That is the only information that I am aware of, that one letter that you provided and discussed with Mr. Forte that discusses that issue. Let me point out that what Hartzell was doing was looking at, if you will, a burden that they had of 35,000–36,000 propellers out there. They were trying to find some rationale to convince the FAA to limit our imposition of a burden to a small number. And they, essentially without any supporting rationale said, Why don't you inspect all the Mitsubishi MU–2B–60's?

Mr. PETERSON. Well, why didn't you?

Mr. BRODERICK. Well, as I indicated to you, there are 34,000 other propellers that were identical in terms of the hub.

Mr. PETERSON. But is that a justification to—I mean you are jumping to this, way out to this conclusion that would make it a decision that would be no. Where if you focused in as they suggested, that is something that is doable, and would probably have avoided this catastrophe had it been done.

Mr. BRODERICK. It is conceivable——

Mr. PETERSON. And I don't understand how you got way out here from there, I mean.

Mr. BRODERICK. Because we had no technical rationale whatsoever to limit our consideration to the Mitsubishi MU–2B–60 at that time. Until the second Mitsubishi MU–2B–60 accident, or incident, we had absolutely no technical rationale to do it.

Mr. PETERSON. But Hartzell suggested this to you.

Mr. BRODERICK. As a mechanism for limiting the scope of our inquiry.

Mr. PETERSON. Well, you could have expanded it anytime you wanted. I mean, if you had taken that recommendation, and would have focused in, and you could have found—you found one crack already, you would have probably found the one in this airplane, and by time you get done maybe you will find three or four more, so then you would have realized you had a bigger problem than you thought.

Mr. BRODERICK. That is right.

Mr. PETERSON. And then you would have had another decision to make. But I mean just the fact that you are going to focus in on those hundred and some airplanes wouldn't have limited you from looking beyond that. I mean I don't understand.

Mr. BRODERICK. You are right, Mr. Chairman. I wish, in retrospect, that one of us had made the arbitrary decision to limit, to put out an emergency airworthiness directive exactly like we did on April 28. But it would have been just that, arbitrary. We had no rationale. We need to have a supporting rationale to do that.

Mr. PETERSON. But, you know the manufacturer recommended this. I mean, we have the letter here. So how could you say that is arbitrary?

Mr. BRODERICK. It is arbitrary when the NTSB has recommended that we take action which would be costly against 7,000 of their products.

Mr. PETERSON. Well, they recommended that you look at 1,000.

Mr. BRODERICK. No. They recommended that we look at 7,000. They said we should look at all four-blade props, which are 7,000 props.

Mr. PETERSON. OK. But that is not 28,000.

Mr. BRODERICK. No, sir. But, as I pointed out——

Mr. PETERSON. There is nothing in any of the documentation where you looked at anything other than 28,000.

Mr. BRODERICK. That is right.

Mr. PETERSON. That all of the discussion is that it is going to cost $15 million because you have to look at all these props.

Mr. BRODERICK. Because the reason we talk about 28,000, and maybe that is a red herring, is because they are all identical. We could limit it, again, to the 7,000 four-blade props——

Mr. PETERSON. Well, then why didn't you put the AD on all of these at this time?

Mr. BRODERICK. Because we now have a pattern. We have a pattern of Mitsubishi MU–2B–60 incidents.

Mr. PETERSON. OK. I mean I just don't follow the logic. I mean, you are telling me that these are all the same.

Mr. BRODERICK. That is correct.

Mr. PETERSON. And so you can't tell the difference.

Mr. BRODERICK. That is correct.

Mr. PETERSON. And yet because it happened on those two aircraft now you are going to limit it, where before—I mean I just don't, I guess I just don't follow you.

Mr. BRODERICK. We are limiting it just exactly as you suggested we do. We have a pattern. We are going to start here. If we find out in the next few days that we need to expand it, we are going to expand that AD, and I hope we have we have a nondestructive inspection technique by then.

Mr. PETERSON. Are you looking at any of these three- or five-blade hubs now at this point? Or any of the four blade on these other airplanes?

Mr. BRODERICK. We are looking at the hub, which is identical on three and four blade, 28,000—actually it is 35,000 propellers. They are all identical. We are making a strain survey right now on the Mitsubishi MU–2B–60. We will be able to use that mathematical data to relate to other blades and other hubs.

Mr. PETERSON. Are you pulling any hubs on any other airplanes?

Mr. BRODERICK. No, sir. We don't have enough lab capacity right now. It is full up with every one of the Mitsubishi MU–2B propellers that we can get.

Mr. PETERSON. People that have these other airplanes, have they been notified?

Mr. BRODERICK. No, sir, they haven't.

Mr. PETERSON. Do you think that they ought to be?

Mr. BRODERICK. What would we tell them to do? We wouldn't have any recommendation to them.

Mr. PETERSON. So that is why you don't notify? Is that why you didn't notify people about the Utica accident?

Mr. BRODERICK. We have about 2,000 aircraft accidents of one kind or another. Most, thank God, are not fatal accidents.

Mr. PETERSON. Most of them are pilot error, too.

Mr. BRODERICK. Most of them are pilot error, but 10–20 percent of them involve airworthiness. We get something like 34,000 reports that we call service difficulty reports a year that involve mechanical problems of one kind or another. We get 30 reports a year of mechanical problems of one kind or another on the Mitsubishi MU–2 series aircraft.

We want to send information to pilots that they will immediately pay attention to, not that every week or twice a week they get a letter from the FAA that reports another incident. We want to make sure that we convey to them actionable information that they really take seriously. If we have information that they can take seriously, we will get it out to the pilots as soon as possible.

Mr. PETERSON. So you would be opposed to my recommendation that something similar to what happened in Utica be made available in some direct fashion to the owners and operators of that similar type aircraft.

Mr. BRODERICK. No. I certainly wouldn't be opposed to it. I would question, depending on the number of reports that we ended up getting, question the utility of some of it, but let me point out that as I understand your proposal——

Mr. PETERSON. But I limited it to when you were in an unacceptable mode.

Mr. BRODERICK. That is right, and that is very rare. And so that would be something that is worth considering.

Let me point out that the Board in the past has done something similar to that.

Mr. PETERSON. You are in an unacceptable mode now with these other four-blade propellers. You have not put an AD on these other propellers.

Mr. BRODERICK. I could go back and I think that the Board would—we could go back and convert that to an acceptable recommendation by accepting it, and that is exactly what we are doing, except we haven't taken the time to write a letter. We have, and have since September, accepted the concept that we need to develop a nondestructive technique. We didn't have the priority on it before April 19 that we did after. But there is nothing that we can do that we are not doing now that we know of to accelerate this. We are doing everything we possibly can.

Mr. PETERSON. We have a hard time seeing within the documentation where that last statement—I mean it doesn't—you say that you were doing that, but we find a hard time documenting that in the information we have been looking at, you know.

Mr. BRODERICK. Well, sir, I am sorry that we don't have good documentation. What I can tell you is that we immediately worked with Hartzell in August and September period of last year. Our focus at the time on the manufacturing problem caused us to do a special audit of Hartzell's manufacturing facility.

Mr. PETERSON. But nothing happened.

Mr. BRODERICK. Yes, it did. We found out that there weren't any manufacturing problems that we could detect. Then by the time we got a response from NTSB in January that indicated that they were unsatisfied with our response, as I indicated, we started then reexamining the nondestructive inspection work and put our nondestructive inspection specialists on this project.

Mr. PETERSON. We have no indication that you put those people on in January. As far as we know, you didn't do it until after the accident.

Mr. BRODERICK. We don't have a lot of documentation, nor do we normally in the course of the day-to-day business on incidents like this make that kind of documentation. The only thing I can tell you is that this kind of incident will reaffirm to me the absolute necessity of not only documenting what we do, but documenting thoroughly everything that we are doing when we communicate with NTSB to avoid communications difficulties.

Mr. PETERSON. So you are in the process of putting an AD on these other four-blade propeller airplanes—the KingAir and all the others?

Mr. BRODERICK. We are evaluating what we should do. And yes, we are looking at expanding that AD. How much we expand it, we haven't yet made a decision.

Mr. PETERSON. How soon are you going to make a decision?

Mr. BRODERICK. I hope to be able to make it literally within days, but I would expect that it will take, certainly, several weeks.

Mr. PETERSON. And if you decide not to do this and you are in an unacceptable mode, is anybody going to notify these aircraft owners of this situation?

Mr. BRODERICK. If we have information that we think will do them some good, we will, sir. I am not sure what——

Mr. PETERSON. Well, don't you think this information would do them some good? I mean we have just been over this. Don't you think that they ought to know that two of these propellers have come apart?

Mr. BRODERICK. There is an enormous amount of focus on trying to solve the problem instead of telling them that there is potentially a problem out there. If we can get information, we certainly will do that.

Mr. PETERSON. But why wouldn't you want these people to know?

Mr. BRODERICK. I think that they do know, with all of the pressure that we have.

Mr. PETERSON. I am not so sure about that.

Mr. BRODERICK. Well, we will evaluate that. I will be happy to do that, and we will be happy to provide you for the record our rationale as to whether we should or shouldn't issue a letter to every single owner of these propellers.

[The information follows:]

The NTSB has considered information provided by the FAA's letter of May 21, 1993, and reclassified these recommendations as "open, acceptable action" on June 21, 1993. Accordingly, there is no need to communicate with owners of these specific propellers, as there is no disagreement between the FAA and the NTSB. If, in the future, airworthiness issues on general aviation aircraft are the subject of NTSB recommendations with which the FAA disagrees, and the NTSB classifies this disagreement as "unacceptable action," the FAA will notify all owners of affected aircraft of the NTSB recommendation and the FAA response so that they may decide for themselves an appropriate course of action.

Mr. PETERSON. I have got some more questions, but I will maybe take a break here and see if Mr. Johnson or Mrs. Thurman—Mr. Johnson, do you have any?

Mr. JOHNSON. Well, thank you, Mr. Chairman. I join in the chairman's comments, and I think that we need to devise a systematic way, and maybe it has to come from the NTSB rather than the FAA, of letting the owners/operators of these aircraft know when there has been a problem from the NTSB's point of view, even when the FAA has rejected that recommendation of the NTSB. It seems to me that that sort of notification would at least give the owners some inkling that there is a potential problem out there, even if the FAA doesn't agree that recommendation is worth adopting.

One of the great fears that I think this committee has is whether the FAA has grown to close to the very businesses and corporations which it is directed to regulate. I think there is a great deal of concern there about whether the FAA is adequately protecting the interest of air travelers or whether it is, in part, grown to the point where it is also protecting the interests of the corporations, Hartzell and others, that it is designed to regulate, to control.

It appears the FAA has taken Hartzell's cost estimates on the cost that it would take to inspect these propellers. On the questions that were submitted after the Governor Mickelson crash, in a statement from the Washington FAA to the regional office, the regional office is told to "alert Hartzell that if NTSB recommends grounding for propellers with more than X hours we will probably have to accept it. It is a rough political climate with the new Secretary and Administrator."

That sends a message to me that were it not for the pressure coming from Congress and from the media that maybe we wouldn't be—that the FAA even to this day, even after 2 crashes—would not be pursuing this as aggressively as they are.

I just want to share with you those concerns. That the FAA should continue to be a strong advocate for air safety, and that it shouldn't require continuing pressure from Congress for you to move aggressively.

Mr. BRODERICK. Sir, could I——

Mr. JOHNSON. If you would care to elaborate on that, yes.

Mr. BRODERICK. Yes, let me. The person who is quoted in that—that you were reading from was myself, and, in fact, let me put some context on why I said that to Tom who then reported it to the people in Boston and Chicago. We were telling them to do everything within their power to move as quickly as possible to get these safety actions completed, and we did that using every kind of pressure, if you will, that peers can bring on the others, and that was one of them. And I am pleased to say that, in fact, it worked.

The "new Administrator" I was talking about was, in fact, the Acting Administrator who had just given me a severe upbraiding for why we had not completed the action that was then underway on the emergency airworthiness directive and urged us to do everything in our power to get it out.

As to the issue about getting close to the industry, the only point that I would like to make is it is exactly that lack of closeness which caused us to reject initially Hartzell's recommendation that instead of spending the money to inspect 7,000 that we only spend the money to—well, require owners to spend the money to—inspect 200. So it was a narrowing that Hartzell was pushing us to do that we wouldn't accept.

Mr. JOHNSON. Well, your response to the suggestion that only a couple of hundred be inspected was to inspect none of them.

Mr. BRODERICK. No. Our response, frankly, now is the question of priority. I mean we wanted to inspect, to develop a technique to inspect all of them, and then if appropriate broaden that inspection to the rest of the fleet.

Mr. JOHNSON. The NTSB made several—three safety recommendations subsequent to the Utica, NY accident. One was to develop with Hartzell a nondestructive inspection technique. Second was to determine if the hub arms and the Hartzell propellers should be inspected at periodic intervals. And third, to determine if other Hartzell hubs based on similarity of design and fabrication should be inspected.

The indications that we have is that some attention was given to this first issue of nondestructive inspection techniques, although nothing very productive came of that, but that very little consideration was given to the other two recommendations. Would you comment on that?

Mr. BRODERICK. Well, sir, again I regret the lack of detailed documentation. As I indicated earlier, it didn't take much consideration to recognize the identicality of the other hub designs, so as soon as we knew that we said, OK, whatever we find will likely apply to a broad class. The other two recommendations were dependent on successfully finding this nondestructive testing technique which we have not yet done, and as soon as we do it we will implement those recommendations as appropriate.

Mr. JOHNSON. Have you been able to determine whether there is any historic similarity? Well, are there manufacturing similarities between the Utica and the Governor's hub? Did they come from the same production lot or have close serial numbers or anything along those lines? Has that been pursued?

Mr. BRODERICK. Tom, would you like to?

Mr. MCSWEENEY. My recollection is the Utica was manufactured in 1977 and the propeller hub from the Governor's airplane was in 1979. We have not yet made a determination of exactly how many hubs were manufactured during that timeframe.

Mr. JOHNSON. I yield back to the chairman.

Mr. PETERSON. Thank you, Mr. Johnson.

Mrs. Thurman.

Mrs. THURMAN. Just to pursue what you were talking about, Mr. Chairman, on the bulletin a little bit, and particularly to a response that you made that—I mean I think I can understand the response but I guess maybe I need more information on the kinds of information that you might be getting out.

You suggested that you didn't want to put something out all the time so that people just quit reading it and it didn't become important. What other kinds of information would go out into those bulletins? I would think that a breakdown in equipment might be something that they might look at more importantly than some other kinds of things, but I don't know what those other kinds of things might be.

Mr. BRODERICK. Well, let me give you an example of something that happened not too long ago that we find useful to disseminate information. A month or two ago there was a front page story in the Wall Street Journal about auto pilot problems on Boeing 747's. Seven times in the last 30 years there has been a particular kind of malfunction. In a couple of those instances the airplane became nearly out of control. As I remember it, one of them was a foreign passenger-carrying airplane and the other one was a cargo airplane, but the details aren't important.

One knows that if you have literally tens of millions of uses of something once in a while it is going to fail. We reviewed the auto pilot and could not find a way to improve it that wouldn't itself have a failure rate worse than what we had currently. So what Boeing did is Boeing sent a letter to every operator of those airplanes for dissemination to the pilots, an "All Operators" letter, all around the world.

A few months later we sent a different but similar subject letter to all the airplanes in the United States, again so that they could refresh their pilot's minds again, telling them, "Look. This can happen in an auto pilot. This is what you do to prevent it, and basically it was instrument scan, keep an eye on the attitude indicator at all times; this is how much time you have to react."

So it is information talking about, as you indicated, a mechanical breakdown. It tells you what happens, what the circumstances are, and what to do about it. In the case of something like this, we don't know anything other than the malfunction, and right now, today, I am not sure what utility that particular piece of information has. We certainly, as I just indicated, will look at that and see if in the next week or two we can get some useful information to give to pilots. But what would a pilot do with information that says that two or three propeller hubs have shown cracks. One of them was taken off the airplane before it broke. The second one broke and nothing—the airplane landed with damage but nevertheless landed safely. And the third one resulted in the tragic accident involving the Governor South Dakota. Period.

Mrs. THURMAN. But I guess the question that you would have to come back with is, Isn't that something that should be left up to the people that are disseminating that information in their own minds as to what they want to do with the information? But to have the information is the most important to them.

Mr. BRODERICK. Well, you raise a good point, as did the chairman, and we certainly will look at that in cases—especially when you narrow it, as Mr. Johnson said, in cases where we disagree with the Board. Perhaps there is a system that we should have that in some way at least informs people of the technical circumstances and the disagreement. It is quite rare, but as I indicated, we will look at that.

Mr. PETERSON. Well, I just have a—you know, we have this, whatever this is here, there is questions evidently submitted by Mr. McSweeney to Chicago and we have this transcript, and just this whole tone of this, that you are going to probably have to accept this. And then it says here, can we justify limiting the possible AD action to just the Mitsubishi MU–2B–60. I mean it just kind of—it is like you are being drug into this. I mean it really does seem like you are taking the side of the manufacturers almost, you know, in the tone of all of this.

Mr. BRODERICK. Actually, the manufacturer, as you pointed out, Mr. Chairman, had been urging us to do exactly that, and we were looking more broadly until the accident involving the Governor, in which case we focused.

Mr. PETERSON. We have a hard time understanding all of this. You were supposed to have this expert studying how to figure out how to do this nondestructive inspection, and here is all we can find that he accomplished. You said he was on since January and the only thing we can find is this scribbled out, 3-line memorandum that was faxed to you on April 22 after the accident. And what it says is, Tell Hartzell—which you can hardly read because it is scribbled—to one, do bore slope, two, evaluate best of ET, whatever that is, and then use best.

Now that is the extent that we can find of what this expert was doing. I mean it looks to us like—that this was just kind of cobbled together because they had this accident and that you should have been doing something. I mean unless there is more that we don't know about.

Mr. BRODERICK. As I indicated, Mr. Chairman, there is not a lot of documentation. The kind of work that we do when we send somebody like Dr. Broz to Chicago is to have him walk in the factory or walk in the laboratory, sit down and do examinations. I must admit that we do not take time to document.

Mr. PETERSON. Well, what kind of a report is this?

Mr. BRODERICK. That is not a report. Nor did we demand a report from him. We didn't expect a report from him. We wanted him to get people to do things, not to write reports.

Mr. PETERSON. But nothing got done.

Mr. BRODERICK. On the contrary. What he has done in reference to that is develop the airworthiness directive and issue it. And right now as we speak he is——

Mr. PETERSON. After the accident. I mean had we not had this accident what would have happened?

Mr. BRODERICK. This accident changed dramatically the priority that we placed on this problem.

Mr. PETERSON. Well, obviously. A lot of things happened all of a sudden. I mean our question is, again, what was happening during all this period of time when you ostensibly were working on this.

Mr. BRODERICK. Mr. Chairman, we did not put the priority on this between September and April that we have since then.

Mr. PETERSON. Not only that. You sent 2 letters to the NTSB saying that you would not do inspections, period.

Mr. BRODERICK. Actually if you—the top paragraph on the letter said that we did not accept the recommendation. If you read the letter carefully, it talks about "at this time." And I regret deeply the fact that we didn't tell them that we were working on that.

In our view we were working on trying to figure out how to do what they wanted, and it was not until the January letter that we realized we had a disconnect.

Mr. PETERSON. Well, you know it is troubling, you know, to everybody because of what ultimately happened with this situation, and I just think—you know I just think your response was not adequate, and I, you know, really regret that we are in this situation.

I don't know, Mr. Machtley, if you have——

Mr. MACHTLEY. I have no questions. I am sorry that I was unable to be here for the whole testimony. I think that certainly the concerns are very valid. When people's lives are lost and there is some question as to whether or not the FAA has purchased recommendations, that is a very serious issue. I have had other hearings I have had to attend.

Mr. PETERSON. Any other members have anything else?

[No response.]

Mr. PETERSON. I really want to keep in close touch with you on this whole issue about where you are heading with these other airplanes, and this process of notifying. I feel like we need to do something. When you are out of sync with the NTSB and it could affect the airworthiness of that airplane, I just think we need to consider some kind of interim step. And, if you folks can do it within your regulatory powers, fine. If not, I guess I would consider putting together some kind of legislation to see to it that you do do it. Because I think it could have made a difference, and I think this incident points out why we, maybe, need to look at something in this area.

I see you nodding your head.

Mr. BRODERICK. Well, I will keep in close touch with you and we will evaluate what the appropriate thing to do is. Maybe we can do something quickly.

Mr. PETERSON. And you are going to make a decision shortly on these other airplanes?

Mr. BRODERICK. As soon as we possibly can. As soon as we develop information that enables us to make a decision.

Mr. PETERSON. Thank you. Any other questions?

Well, we appreciate your being with us, and we will continue to stay in touch, and you can rest assured the subcommittee will be interested in what develops here.

Mr. BRODERICK. Thank you, sir.

Mr. PETERSON. The subcommittee is adjourned.

[Whereupon, at 12:45 p.m., the subcommittee adjourned, to reconvene subject to the call of the Chair.]

APPENDIX

MATERIAL SUBMITTED FOR THE HEARING RECORD

Questions for the Record
National Transportation Safety Board

1. By Level, how many recommendations come back from the FAA as unacceptable within 90 days?

2. In three months?

3. In six months

4. What is the average time to resolve "unacceptable" FAA response s at Level I and Level II?

Response: Since January 1, 1985, there have been 101 Class I "Urgent Action" safety recommendations addressed to the Federal Aviation Administration (FAA). Of these 101 recommendations, 11 have been classified as "Unacceptable" by the Board. Of these 11 recommendations, 8 were classified as "Unacceptable" in less than 90 days after issuance; and 3 were classified as "Unacceptable" beyond the 3 month period.

Since January 1, 1985, there have been 1,083 Class II "Priority Action" safety recommendations addressed to the FAA. Of these 1,083 recommendations, 124 have been classified as "Unacceptable" by the Board. Of these 124 recommendations, 74 were classified as "Unacceptable" in less than 90 days after issuance; and 50 were classified as "Unacceptable" beyond the 3 month period.

Safety recommendations classified as "Unacceptable" are never "resolved" -- that is why they are called "Unacceptable." The average time to close-out of a recommendation classified as "Unacceptable" is as follows for each of the classes:

Class	Average time to close
I "Urgent Action"	407 days
II "Priority Action"	750 days

U.S. Department
of Transportation
Federal Aviation
Administration

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

OCT 26 1992

The Honorable Carl W. Vogt
Chairman, National Transportation
  Safety Board
490 L'Enfant Plaza East, SW
Washington, DC 20594

Dear Mr. Chairman:

This is in response to Safety Recommendations A-92-81 through -83 issued by the Board on August 13, 1992. These safety recommendations were issued as a result of the Board's investigation of an accident on September 27, 1991, involving a Mitsubishi MU-2B-60, Canadian registry C-FFSS, which was on a cargo flight. The airplane sustained substantial damage when a propeller blade separated in flight near Utica, New York. The airplane was climbing through flight level 190 when the pilot felt a strong vibration, followed shortly by a loud "bang." The vibration increased and became so severe that the pilot experienced considerable difficulty controlling the airplane. Despite this difficulty, the airplane landed at Utica Airport. There were no injuries.

A-92-81. Develop, with the assistance of Hartzell Propeller, Incorporated, a nondestructive inspection technique capable of detecting hub arm cracks stemming from the inside diameter surface of the hub arm at the approximate location of the inserted end of the pilot tubes on Hartzell model HC-B4 propeller hubs, and issue an airworthiness directive requiring that HC-B4 hubs with 3,000 hours or more be inspected using this technique the next time the propeller assembly is overhauled for any reason, or at the next annual inspection (or equivalent), whichever is first.

A-92-82. Determine, based on the results of the inspections requested in Safety Recommendation A-92-81, if the hub arms on Hartzell model HC-B4 propeller hubs with 3,000 hours or more should be inspected at periodic intervals. If such inspections are warranted, issue an airworthiness directive, as appropriate, requiring periodic inspections.

A-92-83. Determine if Hartzell model HC-B3 and -B5 propeller hubs, based on similarity of design and fabrication processes with the HC-B4 propeller hub, should be inspected for cracking in the hub arms. If such inspections are warranted, issue an airworthiness directive, as appropriate, requiring periodic inspections.

FAA Comment. The Federal Aviation Administration (FAA) is reviewing the service history of the Hartzell Propeller hubs to determine the magnitude of the problem. The FAA is also reviewing the service manuals to determine what, if any, changes need to be made.

I will apprise the Board of the FAA's course of action to address these safety recommendations as soon as the review is completed.

Sincerely,

Thomas C. Richards
Administrator

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